RAILROAD GAZETTE

FRIDAY, APRIL 30, 1897.

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Car Lighting by Electricity—Atchison, Topeka & Santa Fe.

We are advised that, as a result of the service tests of the Moskowitz car lighting apparatus, which have been conducted on the Atchison, Topeka & Santa Fe, it is the intention of that company to use electric light for its passenger trains, if the results of further trial are as favorable as those so far obtained. An order has recently been placed with the National Electric Car Lighting Company for equipping 50 coaches at once, with the option of 150 more on the same terms.

The apparatus used with the Moskowitz system of electric lighting was fully described in the *Railroad Gazette* Oct. 30, 1896, but since that time a few important changes have been made. One change consists in using but one belt, which passes over the pulley on the axle, and drives the counter shaft of the dynamo, while the spring-cushioned countershaft carries an idler directly in line with the dynamo and axle pulleys. The best results in service have been obtained with a camel-hair belt 3½ in. wide. The ends of the belt are upturned and clamped between steel washers in such a manner that no metal comes in contact with the pulleys, giving the same effect as a continuous belt.

The trial made on the Atchison, Topeka & Santa Fe consisted in running one completely equipped passenger car in various kinds of service. The car was used from the middle of November until the first of January on a local run between Chicago and Streator, 94 miles, making a round trip every day. From the first of the year to the present time it has been in service on the through trains between Chicago and Denver, having made in all considerably over 30,000 miles. From the experience gained it is estimated that one belt will make about 45,000 miles before becoming worn sufficiently to require renewal. As the maximum power which the dynamos can utilize is but 1½ H. P., it would scarcely be possible to measure the extra train resistance due to the addition of the dynamos, especially as other conditions in service act to make this resistance a widely varying quantity.

The Atchison, Topeka & Santa Fe was able to make very favorable terms for this equipment, as it is the pioneer in adopting the system.

South Dakota Railroad Law.*

The act to regulate common carriers, etc., passed by the last legislature of South Dakota, is very sweeping, and besides is carefully worked out in detail. It consists of 45 sections, the provisions of which may be summarized as follows:

Sec. 1 provides that the act shall apply to all common carriers, railroads, express companies, car companies, sleeping car companies and freight line companies, street railroads excepted.

Sec. 2 gives the Railroad Commissioners general supervision of all railroads operated by steam; they must inquire into neglect or violation of law, and inspect the condition of each railroad and its equipment, and the conduct of its business. Whenever a railroad neglects or disobeys a law, the Commissioners shall tell it what improvement or change should be made, sending notice in writing to any station agent, clerk, treasurer or director; and the facts must be put into the annual report of the Commission.

Sec. 3 empowers the Commissioners to examine rail road officers under oath and to examine papers; noncompliance by an officer of a road shall be a misdemeanor subject to $1,000 fine. Sec. 4 requires railroads to furnish suitable cars to all applicants, so far as possible; to receive empty or loaded cars from connecting roads and not to discriminate between roads in the charges on such cars.

Sec. 5 requires all charges to be reasonable and just. Sec. 6 forbids discrimination by special rate, drawback or other device. Sec. 7 forbids preference to any person, company or locality, or to any kind of goods, except that live stock and perishable property may be given preference as to time of shipment. All carriers must afford reasonable and equal facilities for interchange and for switching cars; any carrier may be required to transfer cars for another, rates to be prescribed by the Railroad Commissioners.

Sec. 8 forbids receiving any greater compensation for a short than for a long distance where all or *any portion* of the shorter haul is included within the longer; and no freight rate on any part of a company's line shall be more than fair or just as compared with the rate for similar service on any other part.

Sec. 9 forbids pooling of freight or earnings (same as Sec. 5 of the Interstate Commerce law).

Sec. 10 requires tariffs to be printed and kept for public inspection in every freight office and passenger station, where the same can be conveniently inspected, and a printed notice must be posted indicating where in the station such tariff can be found. Rates must not be advanced except on 10 days' notice; they may be reduced without previous public notice, but reductions must be published as soon as made. After a change is made the carrier must not deviate from the rates as changed. Tariffs must be filed with the Commissioners, also all contracts, agreements, etc. Joint tariffs must be filed and must be published to such extent as the Commissioners require. Neglect or refusal makes the road liable to a penalty of $500 for each day's failure. The Commissioners, when applying for a writ of mandamus, shall not be required to give bonds.

Sec. 11 forbids any agreement or arrangement by which the carriage of freight is prevented from being continuous from the place of shipment to the place of destination.

Sec. 12 makes the carrier, in case of violation of this law, liable to the aggrieved person or persons in twice the amount of damages sustained, with costs and attorney's fees. Any aggrieved person may complain to the commissioners or bring suit in court, but cannot pursue both remedies at the same time. In a suit of this kind the court may compel railroad officers or agents to testify and produce papers.

Sec. 14 provides that, except as provided in sections 25 to 31, inclusive, and unless relieved from the consequences of law-breaking, as provided in Sec. 18, any carrier or agent willfully violating the law or permitting or aiding violation shall be subject to a fine of $500 to $5,000.

Sec. 15 makes it the duty of the Railroad Commissioners to inquire into the management of all common carriers subject to the act, to require attendance and the production of papers and to invoke the aid of any court; and the court shall punish as for contempt any contumacy on the part of the carrier.

Sec. 16 provides for the presentation of complaints to the Commissioners by any person or association; the Commissioners shall send the complaint to the carrier, calling for satisfaction, which, if given, shall relieve the carrier from liability for that particular offence. If satisfaction be not given the Commissioners shall investigate. They may also investigate on their own motion and no complaint shall be dismissed because of the absence of damage to complainants.

Sec. 17. Investigations must be reported in writing, with findings of fact on which they are based, and the reports shall thereafter be prima facie evidence as to every fact found.

Sec. 18. When violation of the law is found the Commissioners shall notify the carrier to cease and desist or to make reparation, or both; if the carrier complies it shall be relieved from further liability for that particular violation of law.

Sec. 19 empowers the Commissioners to go to the Courts when a carrier refuses to obey its lawful order, and the Court, on short notice, may appoint a hearing. It shall sit as a court of equity and not require formal pleadings; it shall have power to prosecute inquiries in the case in any way it may think needful. If violation of law is found the Court may issue an injunction, or other proper process, with a penalty of not exceeding $1,000 a day for failure to obey the injunction. The right of appeal to the Supreme Court of the State shall be maintained, but the Commissioners when appealing shall not be required to give security. No appeal shall stay or supersede the order of the Court or the execution of any writ. The Commissioners may require the assistance of the Attorney-General, and he may have the assistance of the County Attorney; or the Commissioners may employ outside counsel, the expense to be paid by the state.

Sec. 20 requires the Railroad Commissioners to make for each railroad a schedule of reasonable maximum fares and freight rates, including a classification of freight; passenger fares, including ordinary baggage (150 lbs.), must not be greater than three cents a mile, except upon narrow gage roads. The Commissioners must classify the railroads according to their gross earnings per mile for the three years preceding. The Commissioners' tariffs shall be held *prima facie* reasonable and just maximum rates; tariffs must be published in a newspaper in Minnehaha County and in one in Lawrence County. The Commissioners shall give 10 days' notice of a hearing before making their first tariff, but it must be ready to go into effect July 1, 1897.

Any complaint of fares or rates shall be immediately investigated, and if well founded and not trivial the board must hold a hearing. On such hearing the burden of proof shall not lie upon the complainant; the commissioners may gather information from any source, and the lowest rates charged by any railroad, anywhere, for the same kind of service, shall be accepted as *prima facie* reasonable in South Dakota, especially if the railroad complained of charges lower rates in other states.

Sec. 23 requires the Commissioners to fix rates, after a hearing, as provided for, and authorizes the extension of such rates to other roads not complained of.

Sec. 24 prescribes some of the rules of procedure for the Commissioners. Where the law does not specify they may conduct their proceedings as they please. Proceedings shall be public upon the request of any person interested. The official seal of the Commissioners shall be judicially noticed.

Sec. 25 empowers the Railroad Commissioners to require annual reports and specifies what the reports shall contain, including "copies of all reports made by any Station Agent to the Auditor."

Under Sec. 26 any railroad receiving more than a reasonable rate is declared guilty of extortion. Sec. 27 gives additional details about annual reports. Sec. 28 repeats the long and short haul clause of the law, with amplifications. The existence of competition at any point shall not be held to warrant discrimination there against non-competitive points. In this section there is a proviso that the law shall not prevent the issuance of commutation, excursion and thousand-mile tickets, good alike for all applicants.

Sec. 29 repeats the clause against discrimination in rates: the rate for a car shall not be more than the rate per car for several cars; for a ton not more than the rate per ton for several tons (L. C. L.); for 100 lbs. not more than for several hundred pounds (less than a ton); but for the development of a new industry special rates may be granted for an agreed number of carloads, if approved by the Railroad Commissioners.

Sec 30 prescribes a fine of $1,000 to $5,000 for unjust discrimination, and $5,000 to $10,000 for the second and subsequent offenses; or (Sec. 31) if the fine is not assessed a suit for similar amounts may be begun in the name of the state.

Sec. 32 requires the Commissioners to begin suit against any road they may believe has been guilty of extortion, etc. No such suits shall be dismissed without the consent of the Commissioners.

Sec. 33 excepts special rates for the government, national, state or municipal, for charitable purposes; and passes for employees and their families, etc. It allows passes to drovers both ways; also exchange and other passes for railroad employees.

Sec. 34 provides free transportation for the Commissioners, their secretary and agents. Sec. 35 permits joint rates, and Sec. 36 requires the establishment of reasonable joint through freight rates upon demand; carload freight must be transferred where necessary, the cost to be included in the rate. Each road must give the same facilities to local as to interstate traffic.

Sec. 37 requires the Railroad Commissioners to establish through rates when railroads fail to do so, 10 days' notice being given; and by Sec. 38 the Commissioners are required to prescribe the divisions of through rates if the railroads do not do it, the Commissioners taking into consideration the value of terminal facilities and all the circumstances; their division shall be held *prima facie* just.

By Sec. 39 all railroads are required to unite at junctions in suitable platforms and station houses whenever ordered by the Commissioners, and to stop all trains at such junctions when ordered. The Commission may apportion the cost of erecting and maintaining the station. Sec. 40 provides a penalty of $25 a day for failure to provide joint stations.

Sec. 41. The Attorney-General shall at all times advise and counsel the Railroad Commissioners when required, and prosecute their suits. County attorneys have a similar duty. The Commissioners may employ additional legal counsel when necessary. Sec. 42. In addition to all other penalties, willful violation of the law by a railroad shall cause a forfeiture of its franchise. Sec. 43 makes it the duty of the Attorney-General to begin suit for forfeiture whenever the Railroad Commissioners report a violation of Sec. 42. Sec. 44 provides for the punishment of a Railroad Commissioner who willfully neglects or refuses to perform his duties.

Current Recorder for Electric Motor Cars.

Mr. J. R. Cravath, recently Electrical Editor of the *Street Railway Review*, Chicago, has severed his connection with that paper and will devote himself to the introduction of a new device to be applied to electric motor cars for recording the power wasted by the motormen. It has been shown by tests that the power wasted through careless handling of the controller is as much as 20 per cent. The greatest waste of the current occurs at starting and stopping; when starting carelessly only a small per cent. of the power gives useful results in the form of acceleration of the car, the balance serving merely to heat the motors and resistances and wear out the equip-

* South Dakota has also passed an anti-trust law (containing, however, the proviso that it shall not include labor organizations), and a law making the terms of the railroad commissioners six years, one to be chosen every two years. In case of a vacancy on the commission the Governor shall make an appointment to hold only until the next general election. These, with the railroad law, are the only acts particularly affecting railroads that we find in the index of the official report.

ment, while quite often the power is left on until the brakes are set.

This current recorder consists of an oblong wooden box 35 in. long by 2¾ in. × 2¼ in. in which a thin strip of alloy 17 in. long is placed vertically in a groove and is supported by a short piece of German silver wire of such cross-section as to be heated by the current which flows through it to operate the car. The strip of alloy is held against the wire by a weight clamped to the lower end of the strip. When the temperature of the wire has reached a certain point, due to the passage of the current through it, the wire melts its way through the alloy strip, thus allowing the strip and weight to descend. There is also an automatic short-circuiting device, as a precaution, to prevent injury to the recorder or the stoppage of the car should the hot wire melt under an abnormal current.

The recorder, supplied with a new strip of alloy, is locked and given to the motorman at the beginning of each run and is placed by him in the case fixed to the car; at the end of the run he returns the recorder to the office. The act of pushing the recorder into its case closes the car circuit through the recorder. Unless the recorder is in place the circuit is open and the car cannot be started.

The record kept in the office for each man is the number of miles run and the number of inches of metal melted, the recorder giving merely a comparative record of the performance of each motorman, as it does not record except when an excess of current is used. At the end of the month a bulletin is posted showing the performance of each man, and it is expected that this will have the same effect in reducing the amount of power wasted as the locomotive performance sheets have had on the steam railroads.

Careful tests of this device recently made on the Chicago General Railway, showed a saving in power of nine per cent. after the recorders had been in service about two months. This is only a short line, and the motormen are given more direct supervision than is possible on the larger electric roads in Chicago; therefore a greater saving would naturally be looked for where a large number of cars were operated for longer distances.

New Union Station at Columbus, O.

We show in this issue the floor plans of the new Union station, now in process of erection at Columbus, O. This building is being built by the Guarantee Construction Company of Chicago, from plans furnished by D. H. Burnham & Company, architects, also of Chicago, who are superintending the work.

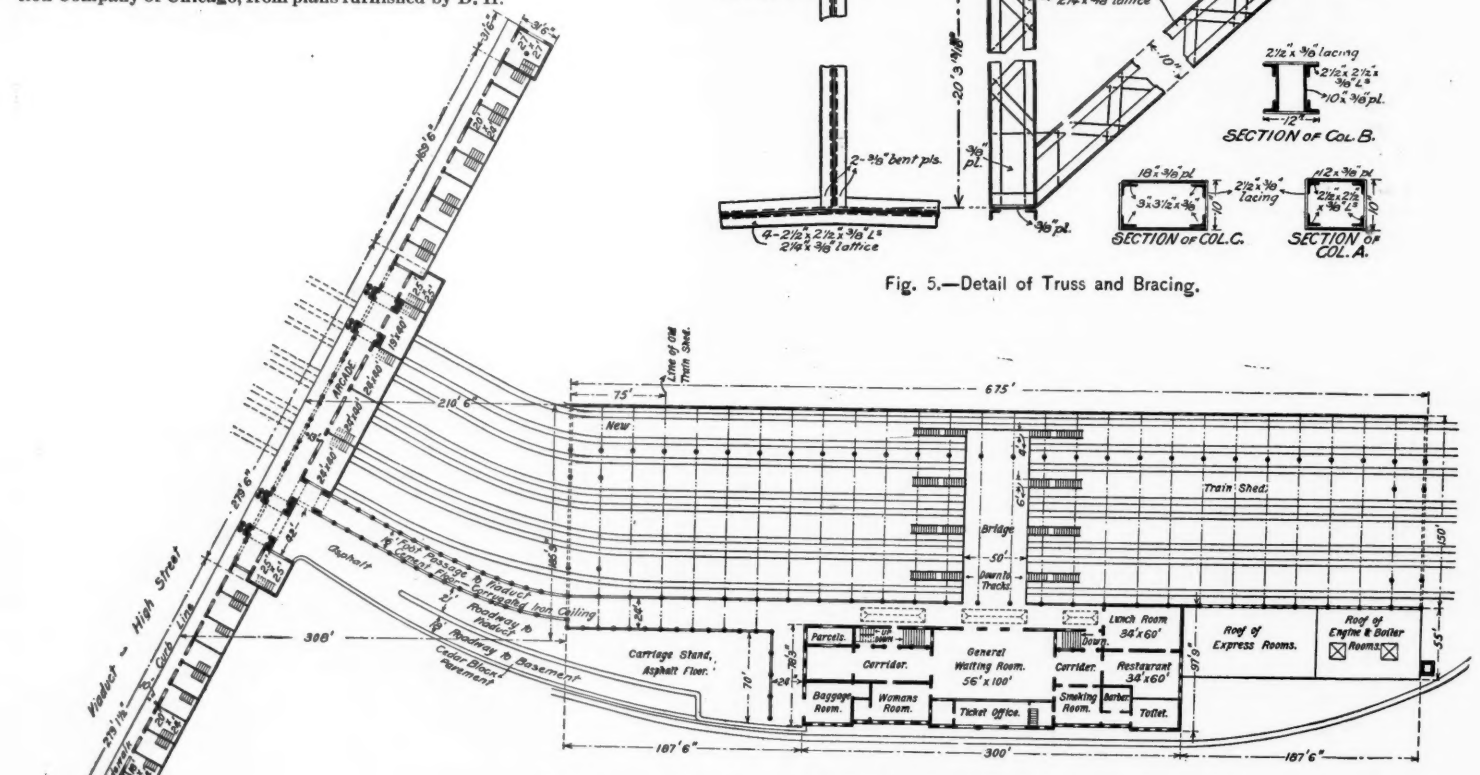


Fig. 2.—Plan of Main Floor, High Street Level, Union Station, Columbus, O.

The station proper consists of a basement, Fig. 1, on a level with the tracks; a first or main floor, shown in Fig. 2, which is level with the floor of the viaduct, and a second story used for offices by the railroad companies. The whole design, from an architectural point of view, is artistic and complete, and the decorations on the viaduct and station are in perfect accord, so that the station may properly be said to commence at the viaduct.

The viaduct in High street, including the approaches, is over 800 ft. long, while the clear space for tracks beneath, between walls, is 279 ft. 6 in. The approaches consist of earth filling retained by heavy stone walls. That part of the viaduct above the tracks is supported by steel columns and plate girders, the latter ranging in depth from 3 to 4 ft. Between the girders are sprung arches supported by heavy angles riveted to the web of the girders. Concrete filling is used above the arches and the surface finish is asphalt for the roadway, while the sidewalks are of cement, resting on arches sprung between steel I-beams.

Along the side of the approaches, toward the station, is a row of buildings, arranged for small stores, which hide the trains from view. These are all two stories in height, with the exception of the ones at the extreme ends, which are three stories.

On the viaduct at the center is an arcade, formed by arches and columns, which is the entrance to the station. The street front of the shops and the arcade is entirely of terra cotta, while the sides and back of the shops are of first quality light buff Roman pressed brick. The partitions between the shops are of 6-in. tiling.

As shown in Fig. 2, an asphalt driveway 21 ft. wide leads from the viaduct to the first floor of the station and terminates in an open space for carriages. This roadway is carried on arches, sprung between 15-in., 60-lb., steel I-beams, supported by masonry walls. The floor of the carriage space is carried on cast-iron columns and I-beams. A covered passage is also provided for pedestrians, 16 ft. wide and separated from the driveway by an 18 in. × 6 in. granite curb, while on the side toward the track there is an ornamental iron railing. The floor is cement and the ceiling and roof corrugated iron, supported by ornamental cast-iron columns.

The roadway to the basement is 18 ft. wide, paved with cedar blocks on the slope and with brick throughout the basement. The outer wall is of brick with stone coping. This roadway is used by baggage, express and mail wagons. Continuous cast-iron wheel-guards 6 in. high are used along the roadways.

By reference to Fig. 1 it will be seen that the basement floor is taken up largely by the baggage and waiting-rooms, while ample space is allowed for an emigrant waiting-room and lunch-room. Each express company has been provided with a room 20 ft. by 40 ft., and a room of the same size is used for mail. The engine-room and boiler-room are at the extreme end of the building.

The heavy columns running up through the building, supporting the floors, have foundations built up of steel beams and concrete, while the lighter columns have foundations of concrete and dimension stone.

The waiting and lunch rooms on this floor have tile floors and enamel brick walls and ceilings. The baggage, express and mail rooms have floors of asphalt and cement plaster ceilings. The engine-room has a glass floor one inch thick, enamel brick walls and plaster ceiling, and contains the engine and dynamo. The building has its own electric lighting and steam heating apparatus.

To reach the trains an underground subway has been constructed, running out under the tracks in the train shed, with iron stairways leading up to the platforms between each pair of tracks, so that it is not necessary for passengers to cross the tracks at grade. The floor above the subway is carried on concrete arches on corrugated iron, sprung between steel girders, while the walls of the passages are faced with enamel brick.

The general baggage-room is on this floor and all baggage which is received from or is to be delivered in the city, is sent to the baggage room on the first floor, for which purpose an elevator 11 ft. × 14 ft. is provided.

As shown in Fig. 1, a track runs the full length on the *south* side of the building; this is to be used for express and baggage cars while loading and unloading.

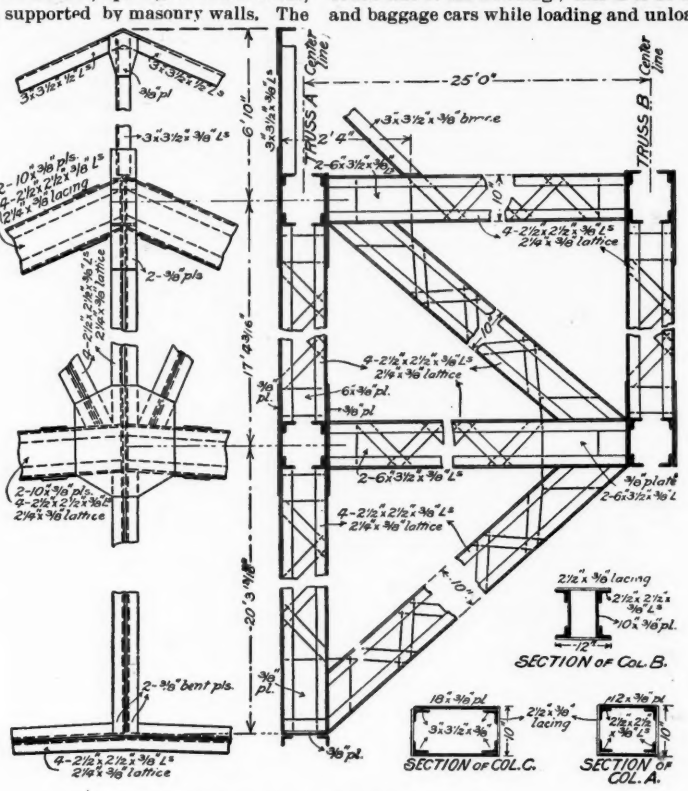


Fig. 5.—Detail of Truss and Bracing.

From Fig. 2 the general arrangement of the first floor is apparent. The interior finish is very handsome, and is in keeping with the rest of the work. The floors, inside the station, are of marble mosaic laid on concrete and tile arches supported by steel beams. The waiting-rooms are finished with marble wainscoting and plaster walls, while the ceilings are ornamental plaster work formed on iron furring and expanded lath. The ceiling of the corridor is a barrel vault with glass panels. The walls of the train shed are finished in enamel brick.

The trains are reached from this floor by a bridge, 50 ft. wide, running out over the tracks, with iron stairways leading down to the platforms. The bridge is supported on steel columns, built up of channels, which carry plate girders and arches, with a surface finish of cement. The bridge has an ornamental iron railing on either side.

The old trainshed will still be used. This, however, has been extended 75 ft. westward (toward the viaduct) and an ornamental screen of copper and iron put in the gables

at both ends. This made necessary a special construction in the first two trusses at either end to carry the wind pressure on the ends of the shed. We show, in Figs. 3, 4 and 5, line drawings of the end and one of the intermediate trusses, beside the detail construction of the end truss showing the bracing to carry the side pressure due to the wind. The roof of the station proper is pressed tile, while corrugated iron is used as roofing on the trainshed and the viaduct shops.

This work will be completed about July 1, and will cost approximately $600,000.

We are under obligations to D. H. Burnham & Co., architects, who have furnished the drawings of this station.

Best Location for the Air Gage Where it Can be Seen by Night and Day.*

The air gage is supposed to indicate to the man handling the brakes what pressure is being maintained; but in consequence of a failure to realize its importance, the air gage has been located in all sorts of out of the way places, and in some cases has been so placed that it is almost impossible to read it in broad daylight, and at night it is entirely lost. To this may be traced, in many cases, the rough handling of trains. It is very important that the air gage be located where it can be seen at any time either day or night, and that without taking the engineman's attention from the track ahead, the signals of various kinds along the line, and trains that are met and passed.

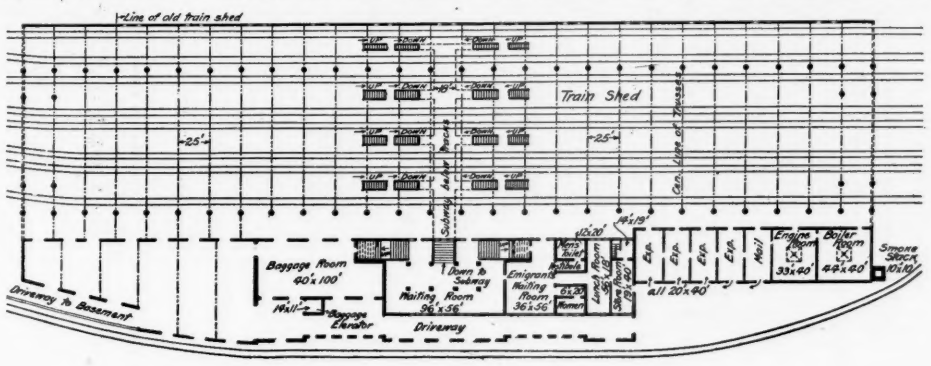


Fig. 1.—Plan of Basement (Track Level).

Smooth and safe braking can be secured in a greater number of cases where the gage is so located that the pressures at the beginning of the application and during the several reductions can be easily read; this is especially true where engines are equipped with brake valves of such type that, in making an ordinary application, the engineer would have to measure and limit the rate of discharge to suit long and short trains. With this type of brake valve it would be necessary to watch the gage closely for two purposes other than the ordinary; first, to see that the speed of train pipe reduction is not so rapid that "quick action" would be obtained; second, with a long train in closing the discharge from the train pipe, to note that no rise in pressure occurs such as would if this were done too abruptly, which would cause the release of the head brakes. With the Westinghouse equalizing discharge valve, however, this action cannot take place, as in ordinary applications the volume of air to be drawn from by the engineer remains constant, the equalizing feature of the valve automatically measuring and regulating the discharge from the train line in proportion to its length, and the brakes are applied as nearly alike as possible on long and short trains. With this valve in good condition, the enginemen soon become accustomed to the length of time required to make a given reduction, and a great many have trained themselves to brake by the sound of air discharging from the brake valve in connection with the effect on the speed of the train; but very likely this plan was forced upon them by the fact that the gage was practically invisible to them part of the day and all of the night, unless they made a special effort to look at it. This latter would, of course, take heir attention from the important duty of carefully tobserving the landmarks and exact points where they should stop.

Next in importance to a good location for the air gage is that it be well lighted at night. Where a poor grade of signal oil for cab lamps is used, and the lamp bracket fastened directly to the boiler, as is quite frequently done, the oil often gets hot, and some of the oils are so adulterated, or so poorly refined, as to cause badly smoked globes. All oils furnished for cab lamps should be of such quality as to give off a clear white light of the yellowish hue we so frequently notice. A good solid lamp that will not commence leaking at the first opportunity, with ratchet for raising the wick; the globe, or hood, securely fixed so that it cannot work around while the engine is running, and only throw the light where wanted, and not all around the cab to blind the engineman, is what is needed.

A practice followed by a number of railroads with splendid results is painting the globe on the *outside*, the first coating being of white paint, the second that of any desired shade. The white coat acts as a reflector and, on account of being on the outside, is easily kept clean. A decided advantage of the painted style of cab globe is the ease with which the paint can be removed, allowing the light to pass through in any desired direction.

Duplex gages for air pressures, as now made by a number of the leading gage makers, approximate a standard in diameter of dials and location of the numerals. Air gages on locomotives should be so attached as to bring the pipe connections pointing directly down, and not rolled over to one side to accommodate crooked piping, as the location of piping is of secondary importance. By placing them squarely, as stated, a given numeral will always be at about the same angle, relative to a horizontal line drawn through the center of the gage.

The pertinent question has been asked: "If 70 lbs. is the standard train line pressure, why is this not better indicated by, say, a heavy cross red line at that point?" We read a gage as we do a watch, not so much by figures as by the angle of the hands. Any unusual position taken by the pointers will be quickly noted by the observing engineman, and he will at once take steps to remedy the trouble the silent monitor brings to his notice.

All air gages should be so arranged that both pointers move in the same direction, as this style of gage is more readily read than the type where the hands start at zero near the bottom of the gage and work up toward full pressures on opposite sides of the dial. This latter type of gage being so different from the regular duplex gage in general use, is quite confusing, and it is a great trial to the engineman to be obliged to use it. The spaces are also much smaller and inaccuracies are not so noticeable in testing.

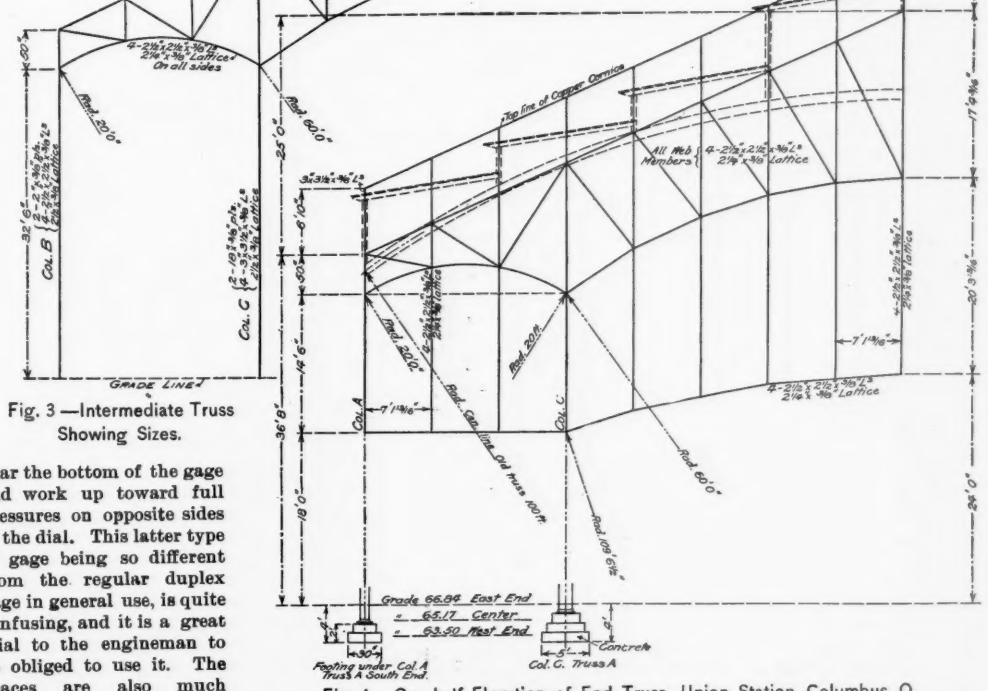


Fig. 3.—Intermediate Truss Showing Sizes.

Fig. 4.—One-half Elevation of End Truss, Union Station, Columbus, O.

Opinions differ among air-brake men as to the best style of gage face; a great many favor the silvered dial with black and red standard colors for gage pointers. The black dial with white train line pointer and numerals possesses the advantage of doing away with the possibility of mistaking the shadow of the train line pointer for the hand itself, this effect being had where the cab light is dim and placed at the left and a little below the air gage. It might also be stated that the reflection of light into the engineer's face from the dial of this type of gage is practically done away with. The discoloration of dials and glasses is considerably less upon engines burning hard coal than upon those burning bituminous coal.

We would suggest to manufacturers that the style of air-gage front be changed somewhat, so as to avoid as much as possible the shadow of the rim on the dial when the lamp is at one side. Care should be taken to see that the gage front makes a good tight joint when put on, and an occasional resilvering of the dial and retouching of the numerals when the gage is being repaired will be found highly beneficial.

In selecting a standard location for air gages, the influence of heat conducted throug the gage bracket and radiated from the boiler, combination stand and injector pipes and valves, should not be overlooked, as the metal parts of the interior of the gage are subject to the laws of expansion and contraction from heat and cold. We think all gage manufacturers will recommend keeping the temperature as much below 100 deg. as possible. The nearer any gage, whether for air, steam or water use, can be kept to the normal temperature the more accurate it will be. All brackets should have an open space of at least 4½ in. in diameter in the flange to which the air gage is to be attached. In addition to this, we recommend an air space between the gage and the bracket by the use of wooden blocks or sleeves of thin brass or zinc pipe slipped over the screws; ¼ in. separation would be ample. We would not suggest locating an air gage nearer than 10 in. to a boiler not lagged. When the boiler is well covered inside of the cab, this distance can be decreased, depending almost entirely on the quality of covering used.

Wherever possible, the gage should be located so that it is about the height of the engineer's eye when in his place on his engine, and so near his line of vision when looking ahead that he can glance at it without turning too much to one side. The object of the designer should be to place them in the best position possible, and in as rigid a manner as conditions will permit, at the same time providing for an unobstructed view of them by the engineer and fireman.

It would appear that these principles should be folfowed by the different builders, doing away with all high bracket fastenings that cause vibration of the gage, together with leaky joints of connecting pipes, at the same time placing no appliances such as lubricators, injector and steam heat pipes and valves between the gages and the view of the engineman. That these principles have been lost sight of in the locating of the air gage on a great many of the older locomotives will be apparent to the most casual observer.

It is believed that the grouping of gages more completely fulfills the above conditions than where the gage is separated from the steam gage. The air gage on all brackets should be placed to the right of the steam gage, never to the left or above it, as is quite frequently done. The flange of the stand to which the air gage is to be attached should be at such an angle as to bring the dial of the gage to squarely face the engineer; this angle will depend on the location of the bracket in relation to the position of the runner. This idea is well worked out on the new Class L engines built by the Pennsylvania Railroad Co., the air gage being about 18 in. from the engineer's position.

As the fireman is an assistant to the engineer in noting anything unusual in the operation of the engine or its equipment, it follows that the gage should be located, if possible, where he can get a clear view of it. Where a type of boiler is used which keeps the engineer and fireman separated, it might be a wise plan to have a single pointer gage showing train line pressure, and so located that the fireman could see it plainly while engaged in

* Extracts from a report of a Committee of the Air Brake Men's Association.

his ordinary duties. We cannot, however, recommend the adoption of a separate gage on the back end of such boilers for the fireman until better headway has been made with the location of the engineer's air gage.

The Committee gives drawings of suggested standard locations of gages, and adds: This report would be incomplete should we fail to acknowledge our grateful appreciation to Mr. Fred. M. Westcott, of the Wheeling & Lake Erie Railroad, for the drawings that accompany this report, made to recommendations sent him by the Chairman. His services were freely given the Committee, with the view that he might contribute his labor "to obtain a higher efficiency in air-brake service."

The committee consisted of Messrs. C. P. Cass, T. J. Mendenhall, C. F. Schraag, Geo. Holmes, W. P. Steele, W. S. Heckman, E. G. Desoe.

Machine Tools Operated by Means of Compressed Air.

The *Railroad Gazette* has from time to time described many novel but serviceable devices involving the recent applications of compressed air in shops. Appreciating its advantages for certain work, engineers and inventors have turned their attention to the subject with the result that its usefulness has been rapidly extended. We describe below in detail a device that will be studied with considerable interest, especially by machinists, inasmuch as they will realize and appreciate the advantages of an improvement in the feed mechanism which is commonly used on plaining machines. This device is the invention of Mr. Alexander Gordon, President of the Niles Tool Works, of Hamilton, Ohio, and is now in actual use on plaining machines.

The sectional views show the device in detail. The air is taken from the compressed air supply, such as is now in use for general machine shop purposes, or from a small pump that may be attached to the machine in any convenient position, and driven by a belt from the countershaft. It is carried from the pump or compressor through suitable pipe to the air cylinder *C*, which controls the feed and driving-clutch mechanism.

A specially constructed valve admits it to the cylinder. This valve is operated through simple connections, fully shown, by the shifter arm and reversing tappets on the planer table. When the table carries the tappet or dog *E* against the reversing lever, instead of shifting the bolts, as in the ordinary planer, it moves the valve lever controlling the air admission to the cylinder. This instantly throws the piston in the cylinder to the opposite end and carries the rack to which it is attached forward or backward to operate the feed-rack. At the same moment the clutch operating the worm-shaft (Fig. 2) is thrown over and the direction of the table motion is reversed. More in detail, this operation is as follows: The outer end of the piston rod shown in Fig. 1 gears in the quadrant marked *D*, which operates a tumbler box D^1, and the travel of this box through a semi-circle operates on the rod *H*, moving the rack *G*, which, in turn, through a gear, operates the horizontal screw, which is located in the rail and which gives the necessary direction to the rail head. The feed rack marked *G*, the segment *D* and the rod *H* are connected, and form part of the feed as indicated above. The amount of feed is regulated by the adjustment of the lower end of the rod *H* in the tumbler box. The amount that this is thrown out of center determines the amount of feed. The click-box on the outer end of the rail, which is operated by the feed rod *G*, is so arranged that this rack feeds only when moving in one direction.

By examining the drawings it will be noticed that the piston rod is carried through the cylinder toward the back of the planer and is connected to a lever. The opposite end of this lever is attached to a rod *A* running across and under the bed to the worm-shaft. On the worm-shaft end of this rod is a segment gear whose teeth work into a short rack. The rack is attached to a rod which moves the central member of the clutch from one pulley to the other and the pulleys are operated one by straight and one by cross-bolt. The illustrations do not show the means of securing the variable speed, but if instead of the single pulleys *P* and *Q*, Fig. 2, cone pulleys are used, variable speeds can be obtained, the same as on a lathe. This is more readily and satisfactorily accomplished by means of friction clutches, as the momentum of the moving parts, which must be checked at each reversal of the stroke of the machine, can be accomplished with a less amount of shock and jar than by the ordinary method. The great difficulty in the manipulation of planers so as to obtain the variations and proportions of speeds is in overcoming the momentum of the table and work on same, pulleys, and other parts, in the reversal of the stroke. This friction clutch accomplishes this very satisfactorily.

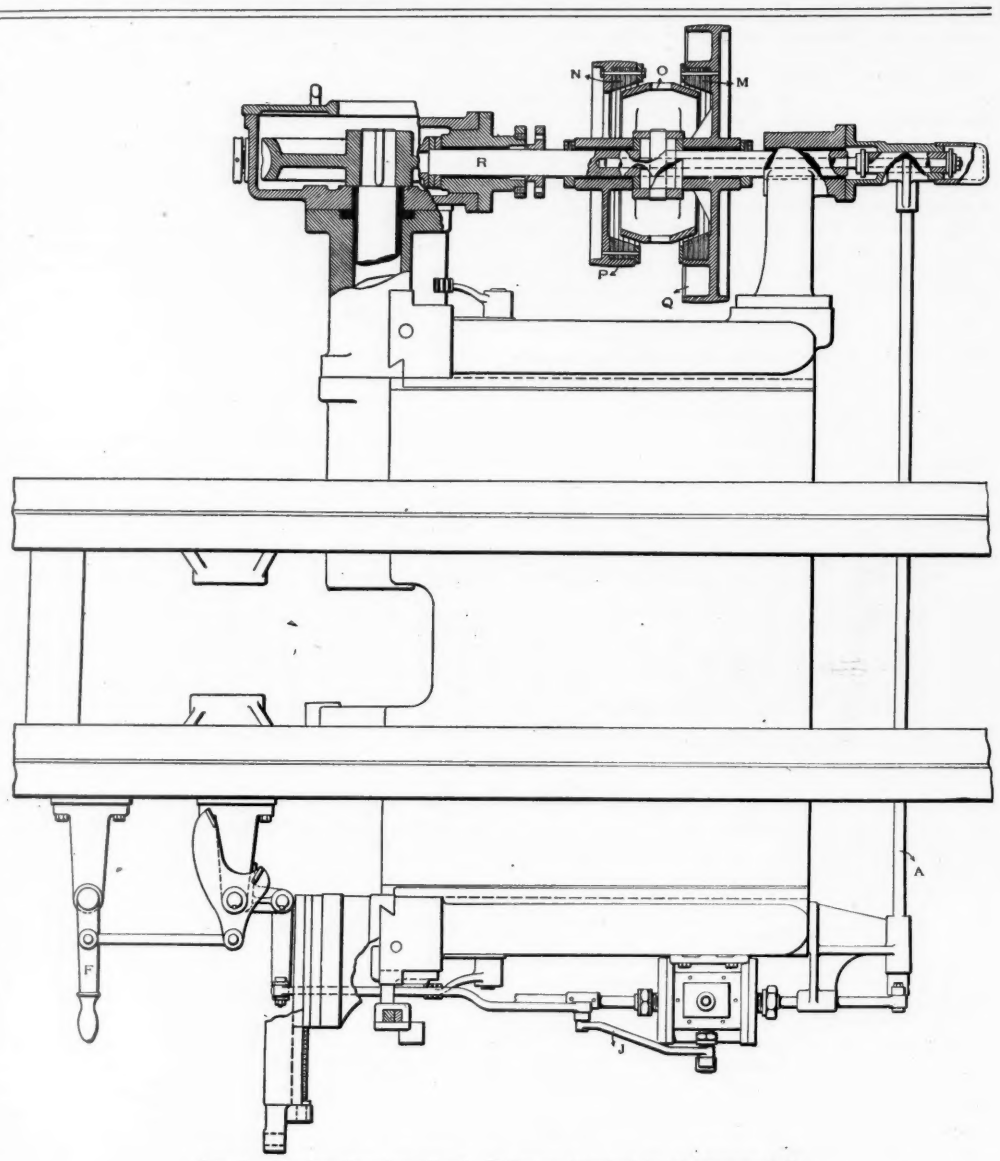


Fig. 2.—Section Showing Clutch Pulley as Worked by Compressed Air.

The clutch *O* is not fixed to the shaft, but the clutch pulleys *P* and *Q* are fixed rigidly, the pulley *O* being shifted from one to the other. The pulley *MQ* is driven by open belt, and drives the cutting speed, and the pulley *NP* is driven by crossbelt, and is for return speed. The part *O* is shifted by the rod marked *A*, which is operated by the piston. The rod marked *R* has a slot in it, by means of which the piece *O* is thrown into either one or the other of the two pulleys.

Provisions are made at the end of the rod *A* for adjusting the throw of the piece *O*, and thus take up the wear of the wood facing *M* and *N*, but the tension of the piece *O* in the clutches can be regulated to a great extent by the pressure of air in the piston.

The belts, running continually in one direction, prevent the excessive wear due to shifting, to overcoming the momentum of pulleys and other parts, and to the rubbing of the edges of the belt in the shifter eyes. The belts can be made as wide as the necessities of the case require, not being limited by the conditions prevailing in other planers. The clutch holds tenaciously under a very slight pressure and is easily released.

There is absolutely no adjustment required in keeping the clutches in working order, as they will do their duty until the wood facing (*M* and *N*, Fig. 2) is entirely gone and the replacing of this facing or lining will cost less than repairing and renewing the belts.

The company has summed up the advantages and merits of this new device as follows: (1) Instantaneous, positive and maximum feeds; (2) quick return, 6 or 8 to 1, with air-cushions positively preventing all shock; (3) economy in operation and power required; (4) no shifting belts, and hence freedom of wear; (5) variable speeds without the use of special appliances; (6) simplicity of design, involving no complicated mechanism, nor necessitating other than the ordinary provision made for any other planer.

A number of these planers, from 30 in. × 30 in to 10 ft. × 10 ft., are in successful operation at the Niles Tool Works, and a 54-in. planer, for locomotive frames, with 35 ft. traverse of travel, is now building.

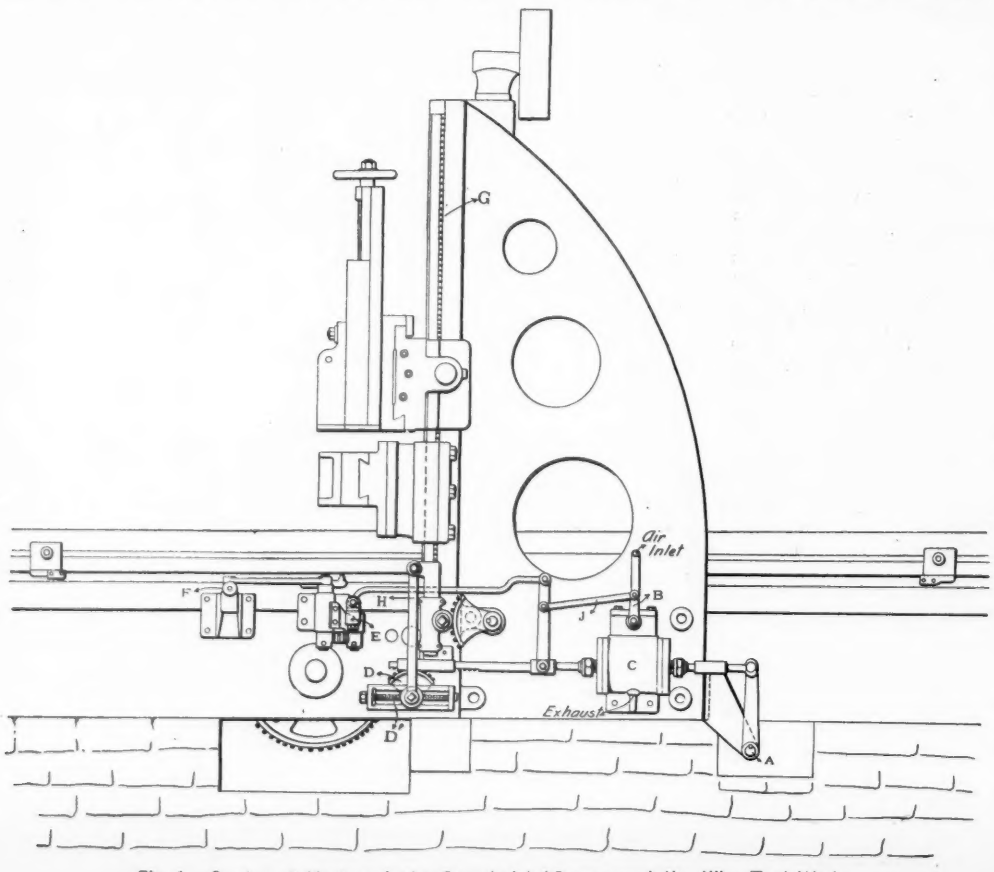
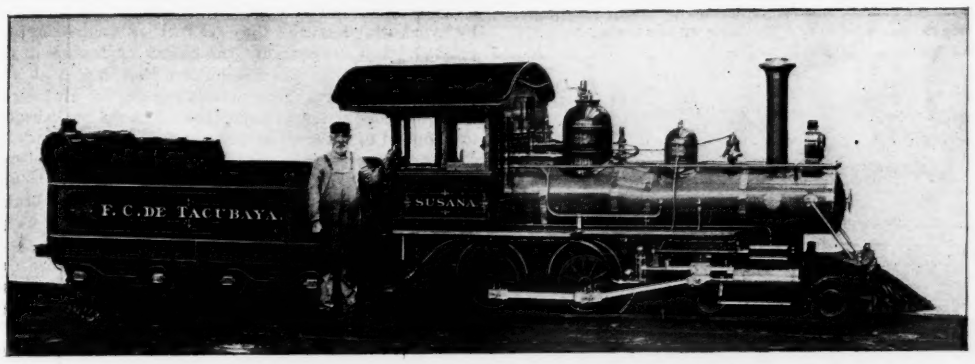


Fig. 1.—Section of Machine Lathe Operated by Compressed Air—Niles Tool Works.

A Small Locomotive for Mexico.

Our illustration shows a miniature eight-wheel locomotive, built for Mr. Fernando de Teresa by the Baldwin Locomotive Works. The engine is to be used for express passenger service on the Ferrocarril de Tacubaya, Mexico, and is adapted to a 23⅝ in. gage.

The fuel specified is briquettes; the length over all for engine and tender is 30 ft.; weight of rails, 14 lbs. per yard; distance to be traveled, 20 miles; water stations, 2,186 yds. apart. The locomotive is supplied with Nathan sight feed lubricator, United States metallic packing on piston rods and valve stems, phosphor-bronze driving boxes, Westinghouse air-brake on drivers, tender and train. The bell, pump, pump check, oil cups and all fittings, boiler jacket bands and running board nosings are nickel-plated. The eight wheel tender carries a tank



Small Baldwin Locomotive for Mexico.

of 600 gallons' capacity, the wheels are 16 in. diameter, with journals 2¼ in. × 4½ in., the tender weighing with fuel and water about 11,000 lbs. The locomotive and tender are painted royal blue with gold and aluminum stripes, the running gear being a bright red with gold lines. The general dimensions are:

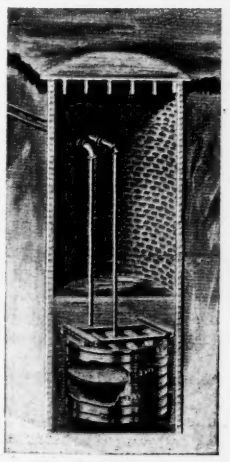
Gage	23⅝ in.
Cylinders	6 × 10 in.
Drivers, diameter	23 in.
Total wheel base	10 ft. 4 in.
Driving wheel base	3 ft. 0 in.
Weight, total	11,950 lbs.
" on drivers	8,400 "
Boiler, diameter	20 in.
Number of tubes	32
Diameter " "	1½ in.
Length " "	6 ft. 0 in.
Firebox, length	23½ in.
" width	15 in.
Heating surface, firebox	13.4 sq. ft.
" " tubes	75 " "
" " total	88.4 " "
Tank capacity	600 gals.

A Locomotive Explosion.

The engraving from a photograph shows the result of a boiler explosion which took place at Ashland, Va., at 4:30 p. m. April 16. The engine was standing on a siding and no one was hurt. It was a 16-in. × 24-in. engine, built in 1882, and was supposed to be in good condition. It was not known to have ever been subjected to any undue strain. It blew off at 118 lbs., the gage having been tested after the explosion. A good many men have examined the torn sheets, but no one has been able to settle on the precise cause of the accident. Experiments will be made on test pieces.

Submerged Water Stations.

The illustration represents a system of locomotive water supply invented by Mr. E. H. McHenry, Chief Engineer of the Northern Pacific. The apparatus consists of a wooden tank placed under water in the ordinary well near the track.



The tank is made of a capacity equal to the amount of water taken into the tender at one draft, and it fills by gravity through valves which open inwardly. An ordinary water column, without the valve and valve gear, is placed alongside the track, and connected to the bottom of the tank by the larger of the two pipes shown. Steam stand-pipes are placed along the track on either side of the water column, and about 30 ft. away from it. A pipe connects these stand-pipes with the top of the tank in the well, and a short piece of steam hose with a special coupling is fitted to each stand-pipe. A float lies on top of the water in the tank, to reduce condensation by separating the steam from the surface of the water. This float is loosely fitted, and is made of red cedar, with the addition of a cork disc or a galvanized iron cell to give more buoyancy.

The locomotive is stopped with the manhole in the tender opposite the water column, thus bringing one of the steam stand-pipes about opposite the steam dome. In the dome of the locomotive is a steam syphon cock which is arranged to be connected with the coupling on the short piece of hose fitted to the steam stand-pipe. When this connection is made, steam is turned on and enters the upper part of the tank by the smaller pipe shown, forcing the water from the tank in the well into the tender tank at a rate of from 1,200 to 2,000 gals. per minute. With an ordinary fire and the blower turned on the boiler pressure will not be affected, but without the forced draft the pressure will ordinarily fall from 5 to 10 lbs. The steam used would otherwise frequently be wasted through the safety valve, and a considerable amount of the energy in the steam taken from the locomotive is returned to the tender in the form of warmer water.

This form of water station may be used to advantage at points where an open well containing not less than about 5 ft. of water can be made. The rate of discharge is practically the same whether the tank is 5 or 50 ft. below the track. Also at places where a flow from an artesian well can be secured, the tank in this case being located at such a depth that water from well will flow into it and at any location where the tank can be placed below the level of river or stream and receive its supply by gravity.

The system has several points in its favor, for instance small cost to operate, there being no pump man and no fuel bill; no danger from frost in any part; few moving parts, hence little wear and slight tendency to get out of order, and reduced first cost.

A number of these stations are in use upon the Northern Pacific and the Duluth, Missabe & Northern, and in their operation and economy have been found practical and desirable.

Messrs. Fairbanks, Morse & Co. have obtained from Mr. McHenry the sole right to build water stations under his patents. Mr. Geo. J. Akers is general agent.

The Pressure-Retaining Valve and its Use.

Your committee deems it advisable to give the history of the introduction of the retaining valve in the air-brake service. About 1876, when the automatic brake was first introduced, the retaining valve was not thought of as being a necessary attachment to the brake equipment as a means of economizing air and making the brake perfectly safe on long and heavy grades. All the roads which had adopted the brake up to that time had no very long or heavy grades, consequently the brake was handled with perfect safety without the aid of retaining valves. As the Western or Rocky Mountain roads were the first to adopt the automatic brake for freight service, it is to that locality that we must therefore turn our attention to obtain a better knowledge of the various stages of the developments in the air-brake service.

After the Atchison, Topeka & Santa Fe, had built over Raton Pass and the Glorietta Mountains in New Mexico, where they had 180-ft. grades on both mountains, and the grades being from 15 to 20 miles long, and the Denver & Rio Grande had built over Marshall and La Veta Passes, their grades being 220 ft. to the mile and from 15 to 30 miles long, it was found that the brake was not perfectly safe on account of the train starting away too quickly when brakes ere released to recharge auxiliary reservoirs. The quick action brake had not yet been invented, and the triples then used being slow action and having four way cocks, the two companies issued orders to trainmen that the trains must be stopped at the top of these heavy grades, and the brake changed to plain brake (straight air). The automatic brake to be used over the rest of the road and on light grades.

In the summer of 1882, one of the members of your committee made some experiments on La Veta Pass, in order to determine what was needed to make the automatic brake more satisfactory and safer on heavy grades. It was found that it took from 6 to 20 pounds of air to hold the train to a steady speed of about 8 miles an hour when descending the grade. This grade was 220 feet to the mile, and was 20 miles long.

These experiments gave an idea of what was needed, and brought out the 10-lb. retaining valve. The valve first adopted, however, was very different in appearance from the one in use at the present time, and was screwed into the exhaust port of the triple valve under the car. It was made with two brass disks, held together by four small screws. Inside was a copper diaphragm with a small brass valve fastened to it. On the other side was a spring set to hold 10 lbs. A small stop-cock was on the other end. The copper diaphragm with brass valve was very similar to the copper diaphragm and valve used in the present Westinghouse pump governor. When the cock on the outer end was opened the air went by the diaphragm and escaped to the atmosphere, but when the cock was closed the air from the exhaust had to raise the diaphragm and valve and escape to the atmosphere in this way until the 10-lb. spring seated it. The train had to be stopped at the top of the grade to put the retaining valves in use. It also had to be stopped at the foot of grades to throw them out of use.

This first style of retaining valve was soon changed on account of it not being possible to handle it from the top of the train.

In the spring of 1884 the Southern Pacific, the Union Pacific and the Atchison, Topeka & Santa Fe gave orders for the automatic brake to be placed on their entire freight equipment. The retaining valve used with this equipment was in appearance like the one in present use. It was placed on the top or end of the cars, so that it could be operated while running. It had the copper diaphragm and valve, with a small vent in the top of each valve, so that in case any air should leak by it could escape to the atmosphere. This was used for a short time, when it was found that water would get through this vent, rust the spring and make it unreliable. This then brought out the retainer with the lead weight and brass valve. None or very few of the railroads had over 20-ton cars at that time, and this 10-lb. valve was found sufficient to hold a train down grades if not over 180 ft. to the mile. None of the standard-gage roads had heavier grades at that time.

In the summer of 1886 the Denver & Rio Grande put retainers on their passenger equipment, and one of your committee was fortunate enough to be on the first passenger train that went out equipped with retaining valves. The 10-lb. valve was found all right, but the train had to be slowed down under schedule speed in order to fully recharge before it would pick up again. A careful man, however, could handle it and get down successfully. After careful consideration it was decided that a 15-lb. valve would make it perfectly safe for the average engineer on these heavy grades. The valves were therefore changed immediately to 15 lbs. and found to be just the right thing.

A Boiler Explosion—Ashland, Va., April 16,

About this time the various railroads of the country were commencing to build 20 and 30-ton cars, and found that the 10-pound valves were too light.

The 15-lb. valve was therefore adopted for all kinds of service. It should be mentioned, however, that when this valve was in use on the heavy grades, when the exhaust raised the weighted valve there was a ¼ in. hole for the exhaust to blow through until the pressure was reduced to 15 lbs., when, of course, the weight seated the valve.

In February, 1891, the Denver & Rio Grande Western changed from narrow to standard gage. Their equipment was all of 30-ton cars; their coal mines were all at the top of the Wasatch Mountains, in Utah. The first seven miles from the summit is a 220-ft. grade. In making this road a standard gage, they took out a great many short curves that had been in the narrow gage, making it a comparatively straight line the whole seven miles. The elimination of the curves, of course, made it much harder to hold the standard gage trains.

The first train taken down this grade consisted of seven 30-ton cars, all loaded to their full capacity. The temperature was 30 deg. below zero and the track was a mass of snow and ice. The brakes were adjusted to a 7-in. piston travel, retainers all turned up and sand kept

* Extracts from a report of a committee of the Air-Brake Men's Association.

running. One of the members of your committee was handling the brakes on this train, and he very soon found, after leaving the summit, that the train had to be slowed down to about five miles an hour, so as to give time to recharge, and even then it was very close work.

The fact was very evident that some change had to be made, and after due consideration of the circumstances in the case, it was decided to plug up the two ¼-in. holes and drill one $\frac{1}{16}$-in. hole. This was done and a train of 16 cars were gotten ready to make a test. An air gage was connected to the cylinder of the eighth car and a stop-watch was used. By this arrangement it was ascertained that the length of time required after the brake was released for the pressure to be reduced to 15 lbs. through the contracted opening was from 30 to 60 seconds. This allowed ample time to recharge before the speed picked up, as 20 to 30 seconds is sufficient to recharge a train of this length. The result of this experiment was so satisfactory that the $\frac{1}{16}$-in. hole was then adopted and is the standard of the retaining valve of today.

RECOMMENDATIONS.

It is the consensus of opinion that the weighted valve adjusted to retain 15 lbs., with a ⅜-in. opening for full release, and $\frac{1}{16}$-in. opening when the valve is in operation, is better adapted to meet all requirements than any other form of valve that has come under the observation of your committee.

On box, stock and combination cars retainers should be located on the end of cars near brake staff, giving at least 1 in. clearance between the car roof and the top of valve, which will give space enough to remove cap for cleaning.

On flat cars retainers should be placed on end of sill near brake-staff, with at least 1 in. between top of cap and floor of cars, in order to prevent lading from striking top of valve; on coal cars, on end of car near brake-staff.

On passenger cars they should be placed up under the hood on the outside, within easy reach of trainmen. but not so close to the door as to attract the attention of inquisitive passengers, as such are liable to cause serious annoyance.

On engines the retainer should be located in the cab on the right side within easy reach of the engineer. On tender, on left side near the top of the tank, just in rear of the grab-iron.

In order to make the retaining valve an efficient device at all times, it is necessary that the brake-cylinder packing be in good condition, pipe to valve tight, and seat of valve clean and true. Care should be used in all cases to see that the valve is in a perpendicular position. In the pipe to the retainer, bends should be substituted for L's as far as practicable, and after bending should be thoroughly blown out with air or steam before putting up.

The following instructions should be observed whenever cars go through shops for repairs; retainers should be cleaned and tested as follows: Top cap should be removed and the seat cleaned, after which the brakes should be applied and released with the handle turned in a horizonal position, and the valve and pipe tested under this retained pressure with soap-suds.

After cars have been painted or varnished, retainers should be closely inspected, as the small port is liable to become clogged with paint or varnish, so that the handle when turned in retaining position will retain the full cylinder pressure instead of 15 lbs. This is specially liable to occur when compressed air painting devices are used in painting freight cars.

Judging from the poor condition of retaining valves and piping found on a great many cars in the interchange traffic, it is evident that the majority of railroad companies pay very little attention to them. This is probably due to the fact that a great percentage of the railroad mileage of the country is over comparatively level roads where retaining valves are not used, consequently the usefulness of the valve is not realized, and the importance of maintaining them in good order is only realized and appreciated by those who operate them on steep grades.

It would seem but fair that all freight cars equipped with air-brakes should have retainers applied and maintained in good condition at the expense of the companies owning the cars.

On grades sufficiently heavy for the use of retaining valves, would recommend them on all cars in the train, regardless of whether the cars are loaded or empty. When necessary to use only a portion of the valves, those on the head cars should be used.

Trainmen and conductors should always be instructed to turn up the number of retainers that the engineer wants, and not what they themselves consider sufficient. If one engineer wants a dozen he should be given a dozen, commencing at the engine. If the next engineer wants them all give them all to him, as he is the man who is handling the brake, and his wishes in this matter should be respected.

In each case retainers should be turned up first at the engine and work back toward the caboose. If retainers are all turned up, and it is found necessary to turn some down, they should be turned down at the rear, commencing at the caboose.

If any of the wheels in the train are found to be heating badly, the retainers on those cars should be turned down for a few miles to allow the wheels to cool off

The percentage of grade on which a train can be handled without the use of retainers cannot be definitely specified. Some engineers are much more skilful than others; circumstances of the condition of the brake, curves of the road, etc., have to be taken into consideration. As the retaining valve is a portion of the equipment which can be used at will, its use must be left discretionary with the men handling the train.

On all heavy grades where switch-backs are used as a precaution against runaways, and where station stops have to be made, care should be observed by trainmen to see that the wheels are not slid when starting after stopping with retainers on, as the wheels are very liable to be flattened from this cause on a frosty or gummy rail. One of the members of your committee has had some experience with slid flat wheels from this cause.

It is the consensus of opinion that the use of retainers on driver brakes on long grades might cause the loosening of tires, and in the absence of definite information on the subject, we would not recommend their use on very long grades, but recommend the use of retainers or tenders in connection with those on the train.

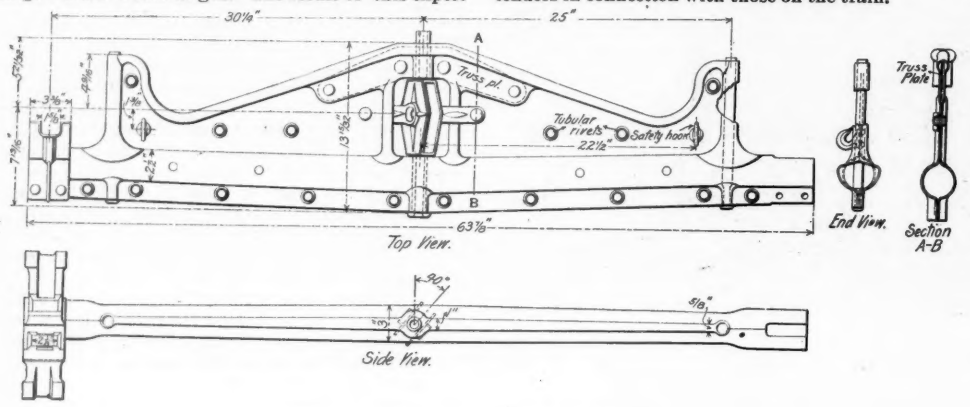


Fig. 1.—Bettendorf Pressed Steel Brake Beam.

Retainers can be used on drivers and tender to good advantage with freight trains on level roads to hold slack, in making water tanks, coal chutes and other accurate stops. We would therefore recommend that all engines be equipped with retaining valves.

It should be borne in mind that the retainer, being an independent portion of the air-brake equipment and operated at the pleasure of the men handling the train, in no way conflicts with the action of the triple valve.

This committee consisted of Messrs. W. I. Steele, F. R. Spalt, H. C. Frazer, C. L. Johnson, M. E. McKee, Geo. W. Fairchild, J. K. Lencke.

The Bettendorf Pressed Steel Brake Beam.

Mr. Wm. P. Bettendorf, President of the Bettendorf Axle Company, Davenport, Ia., has recently designed and patented a metal brakebeam which differs widely from the beams now in use. With this, as well as a number of other railroad specialties about to be put on the market, the same method of construction is used as has been employed by him for several years in metal running gear for farm wagons. This consists in using sheet steel, cut and shaped cold in hydraulic presses; while for joining two plates, in place of rivets, the metal of one plate is forced through a hole in the other, form a bead which binds the pieces together.

Fig. 1 shows the construction of the brakebeam in detail, while Fig. 2 shows the assembled beam complete which consists essentially of a truss formed by two steel plates pressed into shape and joined together.

The sheet metal is first sheared into blanks of the outline shown in Fig. 1 by means of dies placed in a 300-ton vertical hydraulic press. This press is operated by three cylinders using a working pressure of from 1,500 to 3,000 lbs. per square inch, and will shear 10 plates per minute.

By means of suitable dies used in an 1,800-ton, vertical hydraulic press, the blanks are pressed and punched into the form shown by the drawing of the finished beam. This press has two main cylinders which operate to shape the plate, and three cylinders which operate the punches, which are carried on a separate platen working inside the stationary die. This press also makes an average of 10 strokes per minute. One plate of each pair, used to form the complete beam, is punched while the other is merely formed. After being painted with graphite, the plates are placed face to face with the lever casting, finger guard and truss plate between and again put in the 1,800-ton press. The dies used are such that the two plates are held firmly together, while taper punches force the metal of one plate through the holes in the opposite plate. The beam is then turned over and the operation repeated forming a bead. All the tubular rivets are formed during the single series of operations described.

The brakeshoe heads are malleable-iron castings into which the ends of the beams are expanded by means of a tapered mandrel after the heads have been forced on by hydraulic pressure; they are further secured by two solid rivets at either end of the beam. A feature of th brake head is that the hanger can be attached at any one of three points, thus permitting the use of long or short hangers, which is important when the brakebeams are applied to old cars, as new hangers are not required.

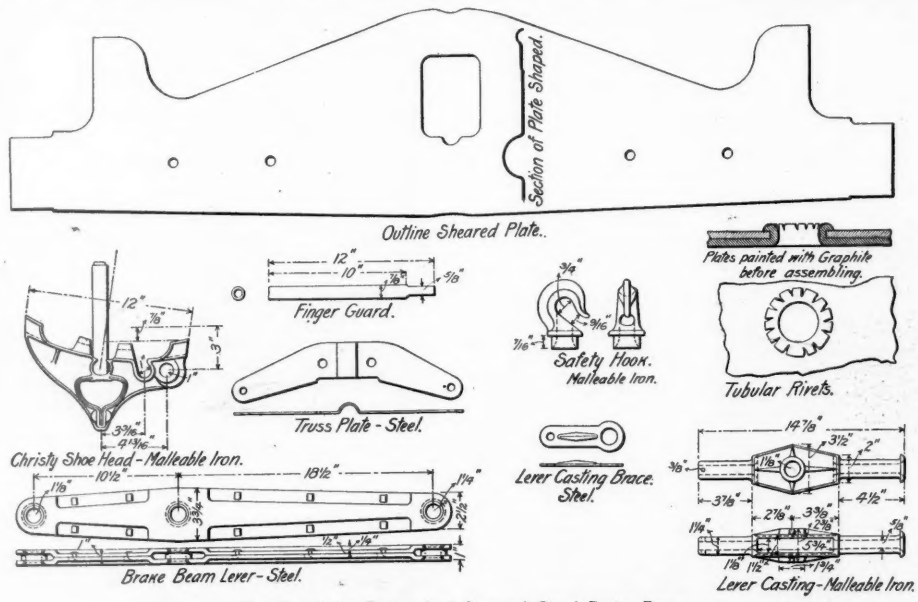
The finger guard is provided to keep the brakebeam in its proper position with respect to the wheels and prevent shifting and consequent wear of the brake-beam by contact with the wheel flanges. The finger can be easily replaced.

Four solid rivets are used through the truss plate, and two solid rivets are used in attaching the lever casting braces; this makes in all 10 solid and 16 tubular rivets in each beam.

The brake lever casting is malleable iron for which journals are formed in the brakebeam. The brake lever, as shown by the drawings, consists of two pieces of sheet steel pressed to shape. Malleable iron thimbles are pressed in the lerers under heavy pressure and form the bearings for the pins. In addition to the castings which assist in joining the plates, the metal of one plate in 10 places is cut and bent, forming projections which are inserted in suitable openings in the opposite plate; by means of pressure these projections are formed into rivets. The brakeshoe keys are also cut and pressed into shape, while cold, from sheet steel.

The weight of the brakebeam complete is 70 lbs., while the brake lever weighs 15 lbs. The following are the results of tests of the brakebeam and lever conducted at the Washington University Testing Laboratory, St. Louis, Mo.:

Test of 70-lb. beam		Test of 15-lb. lever	
Load. lbs.	Deflection, in.	Load, lbs.	Deflection, in.
4,000	0.029	4,000	0.028
6,000	0.046	6 000	0.045
7,500	0.059	7,500	0.060
8,000	0.062	8,000	.....
10,000	0.080	10,000	0.083
12,000	0.098	12,500	0.103
14.000	0.106	14,000	0.109
16,000	0.124	16,000	0.132
18,000	0.204		
20,000	0.322		



Details of the Bettendorf Pressed Steel Brake Beam

Roundhouse Tests of Air-Brake Equipmen on Locomotives and Tenders.*

Very few roads have any systematic method for testing the engine brake in roundhouse, it being left entirely to engineers to discover the existence of, locate and report any defects that may exist. The committee considers this bad practice, owing to the inability of some engineers to locate defects and the cause. In running engines in the pool system the trouble is much the same, the air-brake being sadly neglected on account of engineers having different engines.

It is the opinion of the committee that a daily inspection of the air-brake on locomotives and tenders is desirable and practicable, and should be made by a man of known capabilities, detailed for that purpose. Besides testing brakes he should be able to make running re-

* Extracts from a report of a committee of the Air-Brake Men's Association.

pairs. All extensive repairs should be made at the general repair points. The roundhouse inspector should be furnished with all such complete parts of the air-brake and signal apparatus as are subject to defects. Any part of brake apparatus being removed to be sent to the general repair shops should be accompanied by a card describing the defects. The following is a system for ascertaining the condition of the air-brake equipment on locomotives and tenders, and should be followed daily as far as practicable.

The committee gives very complete directions for inspecting and testing all parts of the engine, air-brake equipment and a form of report.

The following are the recommendations of the committee:

1st. That the air-brake and signal apparatus on locomotives and tenders be tested daily.

2d. That tests be made by a man detailed for that purpose, who should be capable of making such repairs as are necessary in roundhouse.

3d. That a report of the condition of "Air-Brake Equipment on Locomotives and Tenders" be sent to the proper authority at least once a month.

4th. That inspector be furnished with all such complete parts of brake apparatus as are subject to defects; which will allow the necessary changes to be made.

The committee consisted of Messrs. R. C. Cory, Isaac McKeever, Robert Burgess, A. J. Gosselin, L. S. Hawks, Robert Wark, C. B. Conger.

The Marshall Truck Bolster.

The use of metal bolsters in connection with diamond trucks, instead of wooden forms of construction, is just now receiving careful attention from railroad men, especially those who do not favor special forms of side frames and prefer to use the diamond frame. With the loads now carried it is difficult to make a wooden bolster which will not deflect, after being but a short time in service, sufficiently to bring the upper and lower side bearings in contact. This is due largely to the shrinkage of the wood after it has been put under the car.

The principal requirements which a metal bolster must fulfill are rigidity, simple construction and low first cost. It must also possess greater strength in proportion to its weight than a wooden construction. The design must also be such as to permit of its use without changing the dimensions of other parts of the truck.

We show by the accompanying engravings a metal truck bolster designed and patented by Mr. Waldo H. Marshall, who will shortly take the position of Assistant Superintendent of Motive Power of the Chicago & Northwestern.

The essential feature of the design is the use of commercial rolled shapes and malleable iron castings connected by rivets in such a manner that the rivets are not subjected to shear and are not depended upon to transmit the stress from one member to another.

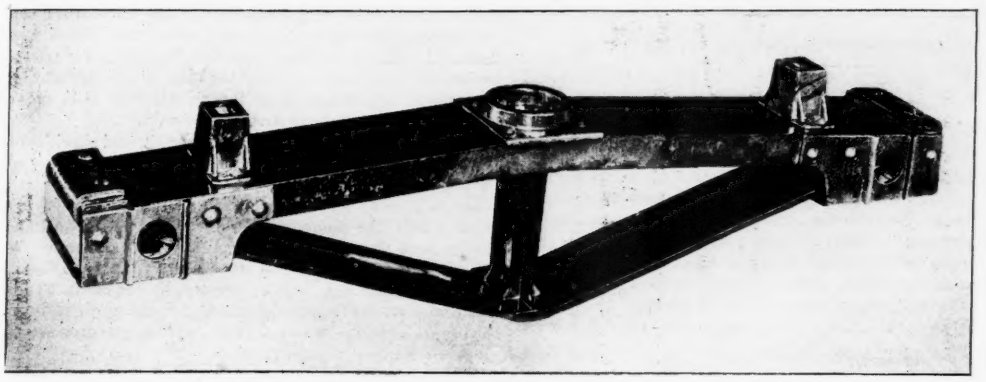
The engravings show a bolster for a 60,000 lbs. capacity car, but it is sufficiently strong to use with cars of 80,000 lbs. capacity. For greater loads than 80,000 lbs. the size and weight of the parts is increased.

The bolster consists of a simple truss with a 12-in. 35-lb. steel channel for the compression member, and a ⅝-in. by 10-in. steel plate for the tension member. The king post is a malleable iron casting which fits closely between the flanges of the channel above and is further held by two lugs on the casting, which enter suitable holes in the channel; the lower end of the post overlaps the sides of the 10-in. plate. Four rivets are used to join the lower center plate to the channel, while each of the malleable iron side bearings are held by two rivets.

At either end of the channel a ¾-in. plate 4 in. long by 12 in. wide is fastened by means of two ⅞-in. countersunk rivets; the lower plate is bent while hot around the ends of the channel and after the insertion of the malleable iron filling pieces, the whole is joined by two 1-in. rivets in either end. It will be noticed that the short ¾-in. plates are the full width of the channel, so that the stresses in the lower member are carried into the flanges of the upper member.

The end castings are malleable iron, and form the upper spring seat. The channel flanges rest on a seat extending the full length of the casting to which they are fastened by ¾-in. rivets.

The bolster, with lower center and side bearings, weighs 565 pounds. Tests made by R. W. Hunt & Co., of Chicago, with the load applied at the center and the supports placed 6 ft. 3 in., center to center, gave a permanent set of less than $\frac{1}{16}$ in., with 50,000 lbs. load; $\frac{5}{32}$-in. with 100,000 lbs., and $\frac{13}{32}$-in. with 150,000 lbs. Up to the present time 1,000 cars have been equipped with the Marshal bolster, which is being handled by the Simplex Railway Appliance Company, Chicago.



The Marshall Metal Bolster.

Oil Fuel on the Great Eastern.

In the *Railroad Gazette* of Feb. 26, 1892, there was published a very complete description of the locomotive "Petrolia," designed by Mr. James Holden, Locomotive Superintendent of the Great Eastern Railway of England, for burning liquid fuel. This was, in fact, the first thorough and mechanical description that was published, so far as we have ever seen, of Mr. Holden's arrangements for burning liquid fuel. The engine can be fired with coal alone, or with coal and oil fuel combined, or with oil fuel only. When oil only is used, the grate bars are covered with broken firebrick and chalk and the fire is lighted with wood. From an account of the development of this plan for using oil fuel, written by Mr. Holden and published in the March number of the *Railway Magazine*, we take the following statement of the present condition on the Great Eastern:

"Thirty-seven locomotives are now in service on the G. E. R., fired with either oil fuel entirely, or with coal and oil fuel combined. Of these six are main line express engines, with single drivers 84 in. in diameter and cylinders 18 in. × 24 in., 10 precisely similar, excepting with 4-coupled drivers 84 in. diameter, one 6-wheeled coupled goods engine with drivers 59 in. and cylinders 17½ × 24 in., one small 6-coupled goods tank (shunting) drivers 48 in. diameter and cylinders 16½ in. × 22 in. Fourteen 4-coupled bogie tanks, with drivers 58 in. and cylinders 17½ in. × 24 in. Three 4-coupled bogie tanks with drivers 58 in. and cylinders 16 in. × 22 in., and two 4-coupled bogie tanks with drivers 64 in. and cylinder 17 in. × 24 in. These tank engines are chiefly working in passenger trains in the London suburban district.

"As regards the storage of the oil fuel and arrangements for supplying the engines, there is nearing completion at Stratford the most complete installation in the world. The tank cars arrive on an elevated track road, and the contents are emptied by gravity into low-level reservoirs, which have a joint capacity of 37,000 gallons; for delivery to the locomotives the oil is pumped by a rotary pump; driven direct from a small steam engine with a cylinder 4½ × 6 in. up into six high-level cylindrical holders, which hold approximately 50,000 gals., and which are placed in an isolated position with an embankment and water-course brought around. For pumping purposes steam is raised in a small multi-tubular boiler fired with oil fuel. Four-inch pipes convey the oil from these high-level holders to two filling columns placed between the engine roads along which the engines pass on their way to the shed, receiving their fuel in from three to five minutes each.

"Various oils are stored: the chief are: 1. Petroleum residue, or Astatki, imported from Russia. This has a specific gravity of 906, with an ignition temperature of 336 deg. Fahr. In appearance it is a dark green color, thick, but sufficiently fluid at 60 deg. Fahr. for dealing with. 2. Green oil, a distillate from coal gas tar. Its specific gravity is 1.122 and it has a flash point of 220 deg. Fahr. 3. Coal gas tar, specific gravity 1.1 and oil gas tar, specific gravity .98. 4. Furnace oil with a specific gravity of .97, and flash point of 250 deg. Fahr.

"Steam pipes are provided which have attachments at frequent intervals for warming coils of flexible steel hose pipe, to be used for heating the fuel if necessary. Oil is kept in this storage for all locomotives stationed at Stratford and for the shop boilers, 13 of which are now fitted with the necessary apparatus for burning oil, also three rivet furnaces. The quantity dealt with at Stratford often exceeds 50,000 gallons per week. Smaller depots have been established at Ipswich and Norwich to supply engines working on those divisions, the oil reservoirs being sunk in the ground, and each engine filling its own tank by means of compressed air displacement operated from the air brakes.

"During the summer season of last year the special fast London and Gromer service was worked entirely by oil fired engines, the trains only making one stop between the two terminals. The running time of the midday expresses was as under:

DOWN.							
	1:36 p. m.	dep.	Liverpool St.	London.	arr.	3:55 p. m.	
68¾	2:55 "	arr	Ipswich		dep.	2:30 "	
	2:58 "	dep.	"		arr.	2:27 "	
130¾	4:15 "	arr.	N. Walsham		dep.	1: 8 "	
	4:18 "	dep.	"		arr.	1: 7 "	
138	4.30 "	arr.	Cromer		dep.	12:55 "	

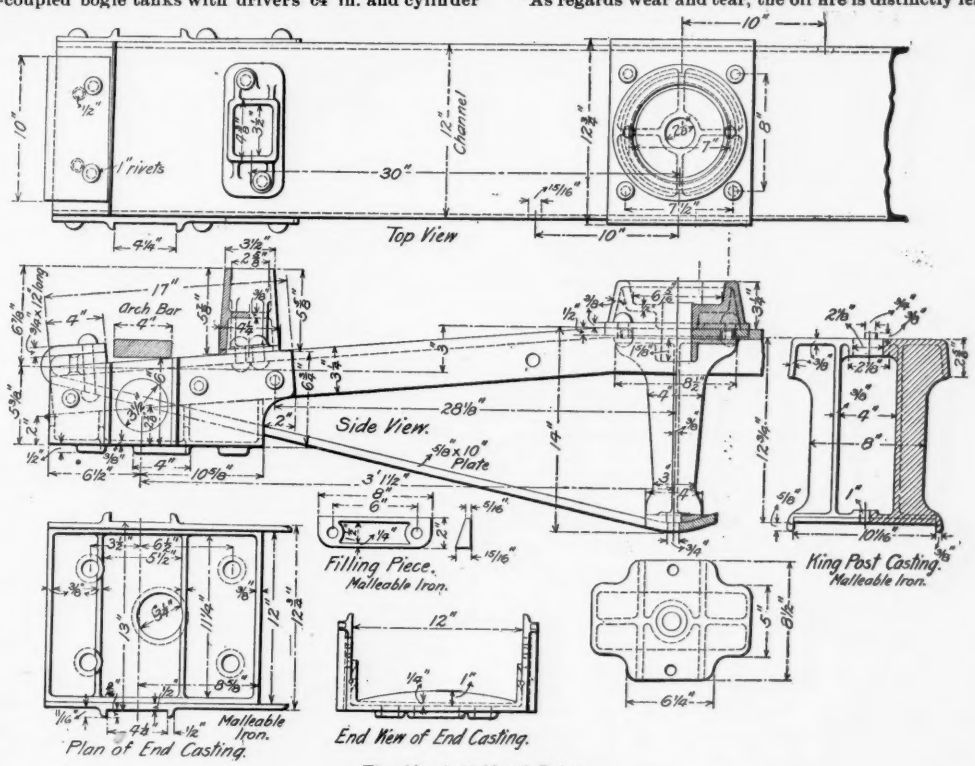
"Although no remarkable speeds were attempted, the above times are good when the various obstacles to high speeds are considered.

"Coming now to the results from a lengthened experience of liquid fuel burning, the writer would point out the following advantages which have become strikingly apparent.

"With the tendency of the English companies of late years to increase the length of the runs without stopping, the work of the fireman and the demand on his ability as a scientific stoker have been greatly increased. With oil fuel no difficulty need be experienced in this respect; the fire can be adjusted at the start of the run and will hardly require a touch until the end is reached. The oil-fired engines of the Great Eastern Railway have frequently run from London to Ipswich with but one adjustment of the fire, signals, etc., being favorable.

"As regards wear and tear, the oil fire is distinctly less trying to the fireboxes. All the engines fitted for oil on the Great Eastern Railway have copper boxes, and these would be very susceptible to racking strains due to changes of temperature, and further they are severely abraded by the particles of half-burnt coal drawn past the plates by the exhaust of the coal-burning engines, and it has been found that the life of the firebox has been greatly prolonged by the use of liquid fuel.

"Another desirable result is cleanliness. . . . On the oil-burners, however, it has frequently been remarked by those who have traveled on them that after



The Marshall Metal Bolster

a 100 mile run the white shirt and the light tie are as clean as when they mounted the locomotive in Liverpool street terminus. The absence of smoke, cinder-dirt, soot and clinker is well known.

"The facility of handling liquid fuel as compared with solid has also been mentioned by other writers on the subject. At Stratford we take every advantage of this we can, and the total quantity used there is handled by four men, of whom one is on night duty, the remaining three attending to the 40 traveling tank cars used in its service.

"During the past 10 years great efforts have been made to secure a regular and organized supply of liquid fuel, and the writer is more than ever confident that such a supply to England must be inaugurated in the near future. When that is secured the substitution of oil fuel for coal in many of the boiler plants in the city of London, on the locomotives of the Metropolitan steam railways, in the electric generating stations of the electric roads and on steamers, and on especially the fast war vessels of Her Majesty's navy must be certain of accomplishment."

Foundation Brake Gear for Locomotive Tenders.

We give below extracts from the report of the Committee on Foundation Brake Gear for Tenders, presented at the recent convention of the Air-Brake Men's Association. The committee consisted of Messrs. W. H. Durant, W. F. Brodnax, F. M. Nellis, Otto Best, John Roney, T. Warren Dow and Eugene McAuliffe. We reproduce probably about one-third of the report. A useful discussion of bad types of brake rigging is omitted for reasons of space.

Several railroads, in their endeavor to procure the most efficient brake for ordinary speeds, have utilized the valuable additional braking force of the leading truck of the locomotive. There was considerable opposition to having driving wheels with brakes, and there has been scarcely less opposition by some to equipping the engine truck with brakes, believing such to interfere with the curving of the engine truck, being the leading truck in the train. But the fact that the pull on the brake levers does not come from an outside point, but comes from a brake cylinder which is located on the truck, produces no more effect upon the truck than if the brake were not applied there. The highest speed trains are being supplied with a special form of quick action brake called the "high-speed" brake. "The Empire State Express" on the New York Central, and the "Congressional Limited" on the Pennsylvania Railroad have been using this special form of brake for two or three years past, with entirely successful and satisfactory results. Several other railroads contemplate the equipment of their high-speed trains with this special form of brake. But there has been neglected a most important factor in braking, one whose assistance is equally valuable with that of middle pair of wheels in the six-wheeled truck. That neglected and underestimated factor is the brake on the locomotive tender.

There are men sitting in this convention who have converted poorly designed and non-equalized forms of different and odd underframing to those highly efficient forms illustrated in Figs. 9, 10, 14 and 15. The Pennsylvania Railroad applies the forms shown in Fig. 10 on all passenger tenders, regardless of whether the tender has a water scoop or not.

Brake Power.—It seems to be the consensus of opinion of those to whom letters of inquiry were sent by the committee, that the braking power should be 90 per cent. of the lightweight of the tender. There are also some who advocate 100 per cent. brake power, and state that they have employed 100 per cent. for some time past with entire success and freedom from slid flat wheels. The greater load carried in proportion to the light weight of the vehicle, and the fact that tenders are seldom, if ever, entirely without a load while in service, seems to indicate that 100 per cent. braking power is worthy of careful consideration.

One member uses the same braking power on all tenders whose weights range between 25,000 and 30,000 lbs., and heavier tenders whose weights range between 30,000 and 35,000 have another common leverage. In replies to the chairman's circular letters, several members stated that they were following this classification method. One member used but two classes for a range of weight between 10,000 lbs., and all his tenders were forced under one or the other of these classes. The lightest tenders of each class were by that process given a braking power of 90 per cent., while the heaviest of the same class were braking at but 75 per cent.

Where tenders of considerable variation in weights are classified as above described, the range embracing different weights should not exceed more than 1,000 or 2,000 at the highest, and it is a matter of serious consideration whether each tender should not be separately weighed and given a leverage that will place the brake power thereon at 90 per cent.

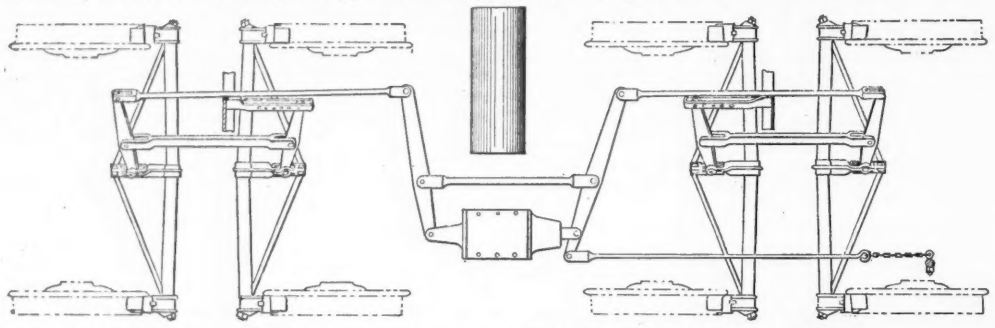


Fig. 9.—Brooks Locomotive Works' Tender Brake Gear

Piston Travel.—Proper adjustment of piston travel is essential to the maintenance of the highest efficiency of the brake, and the roundhouse advantages possessed by the locomotive should obtain a better adjustment than could be had by a car. Quoting from a valuable pamphlet on the McKee Adjuster, recently issued by the Q & C Co. of Chicago, we have the following:

"If two cars having the same sized brake cylinders,

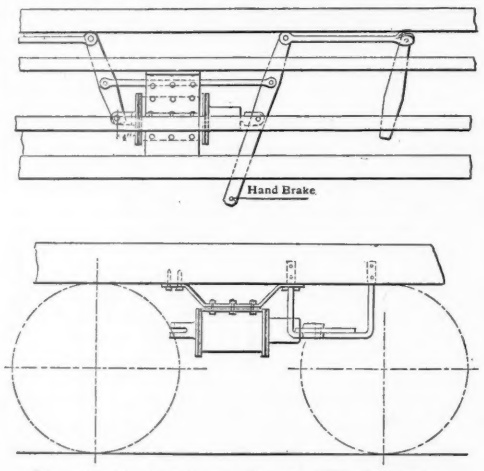


Fig. 13.—C., B & Q. Ry. Standard Tender Brake.

and total leverages of 5 to 1 and 10 to 1 respectively, be adjusted by hand at 6 in., and be placed and kept in the same train, the slack on the latter, or high leverage car, will increase nearly four time sas rapidly as that on the former, or lower-leveraged car; twice as rapidly on account of the total leverage being twice as high, and twice more (making four times) because pressure on the brakeshoes is twice as great and will wear off metal twice as rapidly. By the time the piston travel on the first car has reached 7 in., that on the second car will be nearly at 10 in. With a 7 lb. train pipe reduction, about 13 lbs. would be had in the brake cylinder of the first car, according to the figures of the accompanying table, and the piston on the second car would not be out far enough to bring the brakeshoes in effective contact with the wheels."

The committee believes two valuable lessons applicable to foundation brake gear on locomotive tenders can be taken from the information given in this quotation. First, that to obtain the highest efficiency of the tender brake the brake whose vehicle carries the greatest weight of the proportion braked of any vehicle in the train) the piston travel should be frequently and regularly adjusted. Second, too great a difference in total leverage of tender brakes should be avoided, for it is apparent that piston travel will not increase equally on all tenders, but will vary in the ratio which the total leverage of the several tenders bear to each other. The higher the total leverage employed, the greater will be the wear of brakeshoes and consequent increase of piston travel.

The manufacturers recommend that 8-in. brake cylinders be used on all tenders weighing 35,000 lbs. or less, and 10-in. cylinders on those weighing over that amount. With but two exceptions the replies of the members writing the committee quoted the manufacturers' figures as above given, while the two exceptions mentioned believed the total leverage resulting from the use of an 8 in. cylinder on tenders weighing in the vicinity of 35,000 was too high, and caused the brakeshoes to drag on the wheels when the brake was released. This minority belief seems worthy of further consideration, and it is hoped that the discussion of this paper will be productive of information on this point that the committee was unable to obtain.

This feature becomes more interesting and significant when it is observed that to brake a 35,000-lb. tender to 90 per cent. of its lightweight with an 8-in. cylinder will require a total leverage of 12.6. To brake at 100 per cent. under the same conditions would require a total leverage of 14 and would give a very small clearance between the brakeshoe and the wheel. On a 25,000-lb. tender, with an 8-in. brake cylinder, to brake at 90 per cent. and 100 per cent. respectively would require total leverages of 9 and 10 respectively, and would give better shoe clearance.

To make clearer the point in question, we will again quote from the McKee adjuster pamphlet regarding brakeshoe clearance, which says:

"By 'shoe clearance' is meant the distance the brakeshoe clears the wheel when the brake is off. The shoe clearance bears the same relation to piston travel that the piston pressure bears to the braking power. For example: If the total leverage be 5, the shoe clearance will be $\frac{1}{5}$ of the piston travel, and the piston pressure will be $\frac{1}{5}$ of the braking power. At a 5-in. piston travel the brakeshoes will clear the wheels 1 in. when the brake is off, and 1 in. worn off each brakeshoe will increase the piston travel from 5 in. to 10 in. The cylinder pressure of 3,000 lbs. will give a braking power of 15,000 lbs. This ratio is always true where the brake rigging is rigid, but when those irregularities which cause lost piston travel are present, the shoe clearance will be reduced to the extent that the irregularities exist."

Parts.—Your committee recommends the employment of M. C. B. freight car brake standard sizes of rods, levers and pins on foundation tender brake gear, as it believes the necessity for such sizes is equally important here as on freight cars. A great many roads are using very light gear which springs and stretches, and produces that objectionable result known as "lost travel."

Brakebeam levers should be made a standard proportion for all weights of tenders. Cylinder levers should be made the same length over all for all weights of tenders, and the difference in brake power for tenders of various weights should be made in the cylinder lever. The location of the tie rod hole in the cylinder lever being the only difference made to obtain the maximum percentage of brake power for any weight of tender.

The use of bent and curved levers should be avoided. Suitable carriers should be provided and properly located for the cylinder levers.

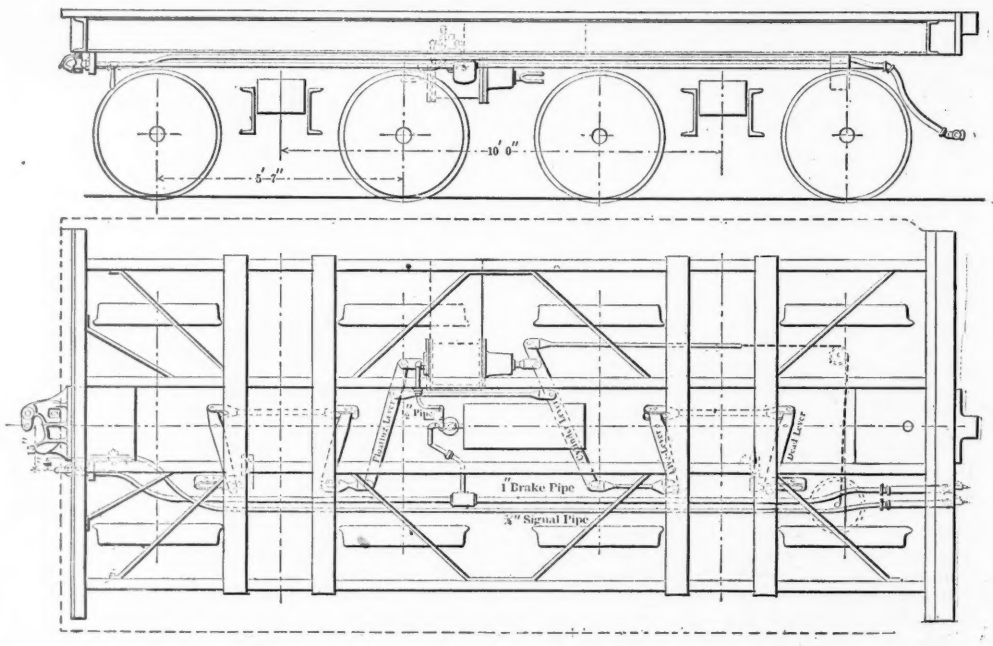


Fig. 14.—Southern Railway Standard Tender Brake Gear.

Brakebeams.—A strong, rigid metallic brakebeam is manifestly preferable to any form of wooden beam; but a well-trussed wooden beam is certainly more desirable than a poor metallic beam. The name "metallic" does

not always imply superiority over a wooden beam. A successful metallic beam is one whose deflection under a maximum load is not considerable, and one which will withstand the hard knocks of service.

Perhaps the better way to determine the real value of the various metallic beams is to observe which type most largely contributes to the scrap heap.

The evil effect of water dripping from the tank on metallic brakebeams has been brought up as an objection

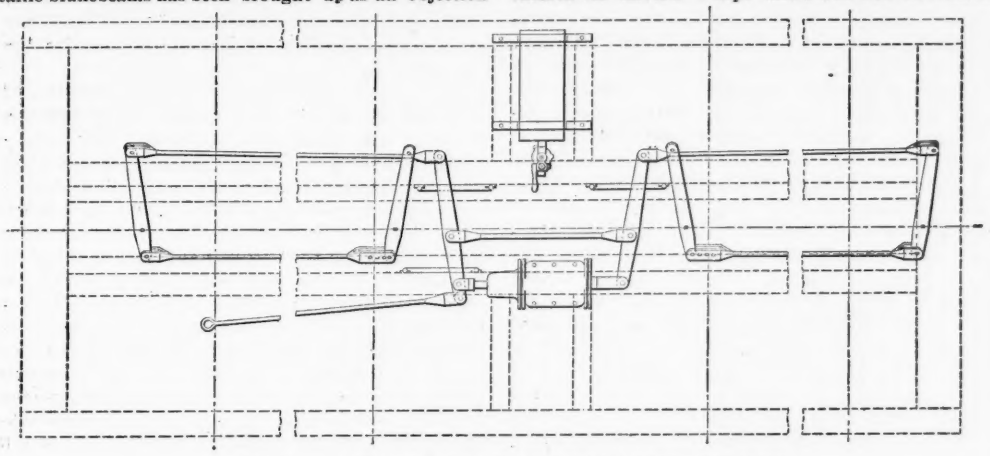


Fig. 15—N., C. & St L. Ry. Standard Foundation Tender Brake Gear.

to their use in this special class of service; but inasmuch as many underframings of tenders are now made of steel, and many more companion parts are made of the same metal or iron, there need be little fear from such a source.

The most desirable method of hanging brakebeams is to suspend them from a stationary point below the springs, so the distance between the brake head and rail will not vary with loaded and light weight of tender.

A most important factor in producing a successful foundation tender brake gear is, when hanging the brakebeam, to locate the brake head so its center is about two inches below a horizontal line drawn through the center of the wheel. The inclination of the brakebeam hanger should be such that a line drawn lengthwise through it will form a right angle with a line connecting the center of the brake head with the center of the wheel.

Correct Types.—The generally recognized superior type of foundation brake gear for tenders is illustrated in Figs. 9, 10, 13, 14 and 15, and is gradually supplanting the earlier forms, some of which have given fairly good satisfaction, because much was not exacted of them, and the necessity for the best possible tender brake was not realized.

The principal advantage had by this form over others is the attachment of the second cylinder lever to the bracket on the front cylinder head. By this plan the forces are neutralized, and there is no strain on the bolts which fasten the cylinder to the tender frame such as is experienced with all other forms. Loose fastenings contribute to lost piston travel.

With this form the breakbeam levers all incline on the same side of a vertical line and the trucks will not interchange. But when we consider the infrequency with which tender trucks are exchanged, this becomes a matter of trifling moment. Some roads use side bearings on the rear tender trucks, but none on the forward trucks, in which event interchangeability could not be effected, and would not be desired.

Some slight objection has been brought up against this form of brake on the grounds, that if the brakes are on while going around a curve, the piston travel will increase or decrease according to the direction and degree of the curve, as will a Stevens type of brake on a passenger car. But inasmuch that the wheelbase of a tender is much shorter than that of a passenger car, the variation of piston travel resulting from this cause is infinitesimal, and is not of sufficient moment to warrant discussion.

On Two Cents Per Mile Passenger Rates.*

Who will gain by reduced rates? The merchant, manufacturer, and all those who can afford to travel for business or pleasure. Those who travel for business make it pay, and can afford to pay reasonable rates. Those who travel for pleasure are well enough off to afford the pleasure, and do not need to be protected against the reasonable rates which now prevail. The poor man will not be a gainer by reduced rates. He does not travel a great deal. He cannot afford the loss in wages and the cost involved. On the average, reduced rates would probably not save workingmen in this state 10 cents each per year. But that which will save a workingman such an insignificant sum, and save more to those to whom it is not a felt burden to pay, will cost railroads millions, and will eventually affect the wages of railroad employees, and the prosperity of the state, because those railroad employees are citizens and voters in your state, and live in it and expend their wages in it.

Statements have been made that railroad rates have not decreased in the past 25 years, while everything else has been coming down. On the contrary, railroad rates have decreased in greater proportion than anything else. Not only have railroad rates decreased in the last 25 years, but railroad dividends have decreased also. The Chicago & Alton to-day is paying 20 per cent. less to its shareholders than it paid 26 years ago, when I first entered its service. I hope that I will not be held accountable for that. At that time, and for a long time after, namely, until 1884, the fare from Council Bluffs and Omaha to San Francisco was $100; to-day it is $50. Consequently, at that time the rate from Council Bluffs and Omaha to San Francisco was $37.50 higher than it is to-day from Chicago to San Francisco. At that time the rate between Chicago and Kansas City was $21; to-day it is $12 50. At that time the rate between Chicago and St. Louis was $11; to-day it is $7.50. At that time the rate between St. Louis and Kansas City was $12; to-day it is $7.50. At that time the local rate on the Chicago & Alton was 5 cents per mile; to-day the local rate is 3 cents per mile, and the actual average rate which we obtain is 2.022 cents per mile. On page 5, last report (1895) of the Railroad and Warehouse Commission of Illinois, the Commission show that "rates in 1870 for passengers were about 46 per cent. higher than in 1895." I have yet to learn that there has been any such reduction in anything else.

The figures of the Interstate Commerce Commission ought to be acceptable as authority, and they show that in a group of States, in which they include Illinois, it costs more per passenger per mile to carry a passenger than the Chicago & Alton for many years has earned per passenger per mile.

Not only have our rates decreased, but wages and other outlays, and especially taxes, have increased. In 1880 taxes paid by the Chicago & Alton amounted to $147,413.53, and in 1896 to $315,745.48, the percentage of taxes to net earnings having increased from $4\frac{24}{100}$ per cent. in 1880 to $11\frac{37}{100}$ per cent. in 1896. Between 1880 and 1896 we have not added to our mileage or to our property in any way. "The taxes have each year been assessed upon exactly the same property."

Competition and other causes in the interest of the public preclude us from collecting on all our business the legal rate of three cents per mile. We are unable to collect it on our through business from terminals to terminals. That compels us to grade our rates for some distance from terminal points. From circumstances over which we have no control, through rates made from points east of us to points west of us, and *vice versa*, and from points north of us to points south of us, and *vice versa*, are not always made in such a way as to admit of our taking out of them as our proportion our full local rate. Also as common carriers, we feel that we ought, as far as we reasonably can, to make special rates for meetings and great gatherings, so as to enable the public generally to participate in the same. We also make very low rates for special week-end excursions to great cities on the line of our road. This is done to enable workingmen, shopmen and others who cannot afford to lose a day's wages, and who cannot afford to pay regular rates, to have a pleasure excursion once or twice a year. Then there is the large and increasing commutation business which will not bear full rates, and which, on that account, and also on account of street-car and electric-car competition, we are compelled to perform at extremely low rates. All this involves that with a legal rate of three cents per mile, we get sometimes an average rate of two cents per mile, and sometimes less. In the years 1893 and 1895 the average figures were less than two cents a mile.

A railroad traffic official is always figuring on how little he can charge, and still leave a profit. That is the secret of success, namely, to move the largest number of people at the least possible rate, and which will still afford a profit. The object is to have rates that will yield a profit, and will at the same time develop the largest possible business. If you will leave us alone to competition, and the necessity of creating business to raise much needed revenue, that will far too quickly bring about reductions in a way that will do the least hurt to all interests. That will also inexorably preclude us from attempting to maintain unreasonable rates, even if we had the slightest disposition to do so, which we have not.

Fictions, struck to earth, rise again livelier than truth and more mischievous than ever. There is a fiction which appears to have immortal life, that there exists a two-cent rate in the state of New York. That rate is in force on a portion of the New York Central, but nowhere else in New York State, and it does not apply to through business, even on the New York Central. Except on a portion of the New York Central Railroad, 3 and $3\frac{1}{2}$ cents is charged and permitted by law. Besides, if the rate in New York state were two cents, that would be the strongest argument for the rate in Illinois being about four cents per mile, as the population per square mile in New York state is more than double the population per square mile in Illinois.

It has been said that some of the lines in Illinois might be able to stand a two-cent rate. It is assumed that the Chicago & Alton is one of the lines included in this supposition. It may, therefore, be expected that something should be stated at this time as to the position of the Chicago & Alton. The Chicago & Alton, gentlemen, is a purely and exceptionally American railroad. It is owned by native-born American citizens who live in this country and expend their incomes in it. Its directors are American citizens by birth, except two subordinates, who do not direct its policy, and who at any rate were caught young. One of them has been over 40 years in this country, and both are perfectly acclimated, mild and harmless, and innocent of foreign habits and opinions, and perfectly up-to-date citizens. I mention all this merely because one country editor who demanded an annual pass for his wife and did not get it, and another who traded or loaned his editorial ticket and consequently had it taken up, suddenly became possessed with the insane idea that the Chicago & Alton was a foreign corporation because it would not submit to be blackmailed or swindled, and they have assiduously devoted themselves to the missionary work of spreading the opinion that we were a foreign corporation because we objected to dishonesty.

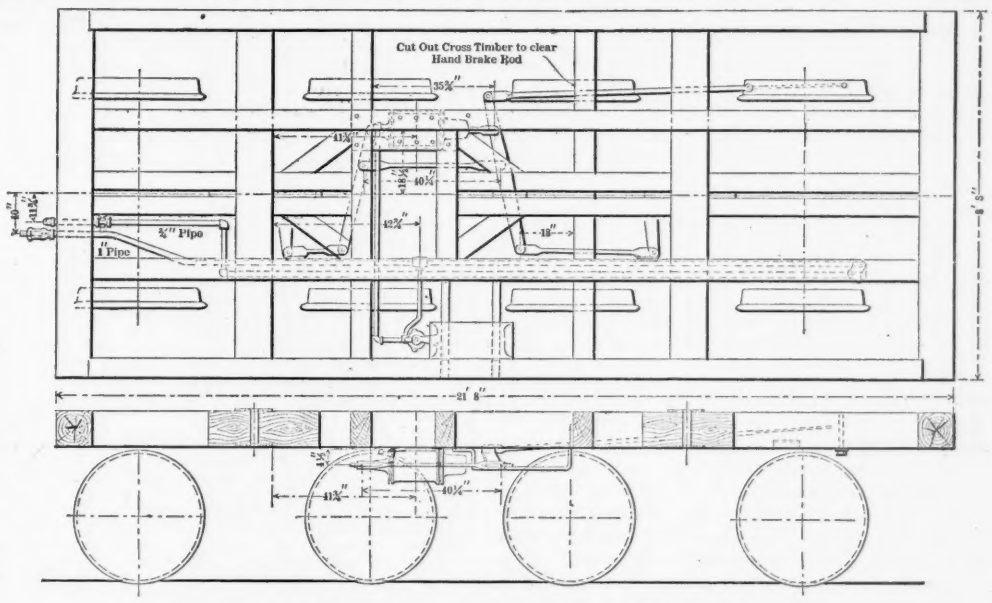


Fig. 10.—P. R R. Standard Brake for Tenders With and Without Water Scoop.

The Chicago & Alton, before my time, was bought at sheriff's sale, and the then buyers, who are still holders of Chicago & Alton stock, instead of taking the earnings of the road, put these earnings into the track and equipment year after year. The road and equipment

(*Continued on page* 312.)

* Extracts from an Address by James Charlton, General Passenger and Ticket Agent, Chicago & Alton Railroad Company, at a public hearing before the Senate Committee and House Committee on Railroads, Illinois Legislature, Springfield, Ill., March 31, 1897.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

Published Every Friday,

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We print in this issue several of the reports of committees of the Air-Brake Men's Association, and we take this occasion to call attention again, as we have done in former years, to the excellent work done by this body. The reports, in style, in substance and ability are quite up to the average of those made to the older bodies. Indeed, it is no exaggeration to say that in the mere matter of literary form they can be placed alongside of the best work done by the other societies. Surely it is fortunate that this important side of railroading is so carefully watched by a body of zealous and industrious men. Their studies of the subjects taken up are worth the careful attention of higher officers, and will, of course, get it.

We have recently received a number of inquiries from railroad men anxious to go to China, as to the prospects, wages, etc., in that country, and within a day or two a newspaper dispatch has been published, dated at Saratoga (but why Saratoga we do not know) saying that great financial inducements are offered to railroad men, as, for instance, brakeman five dollars a day, firemen seven dollars a day, conductors ten dollars and enginemen eleven dollars. Moreover, we are told that these wages are paid in gold and that the agent guarantees transportation both ways, and the reporter, with that gift of imagination which seems to be the most important part of the equipment of the modern newspaper reporter, goes on to say that "the desire to secure American employees is due largely to Li Hung Chang's recent inspection of railroads in this country." We warn railroad employees and others that this is all rubbish. The only railroad now running in China is that of the Imperial China, Railway Company, about 230 miles long, from Tien Tsin northeasterly. The company is building an extension from Tien Tsin, west by north, to Peking, 75 or 80 miles. That may possibly be running by this time. This is absolutely the only railroad running in China, except a piece of narrow gage about 10 miles long in the island of Formosa. Obviously not a great many men can be employed on so small a railroad system. It is true that there is always before us the possibility of building seven or eight hundred miles of railroad southerly from Peking; but this is not built yet, nor even begun, nor are the financial arrangements for building it made. Plenty of men are easily secured for all positions, from the highest to the lowest, in Europe or in China. There is no occasion for paying fancy wages. Any man who pretends that he is in this country for the purpose of engaging railroad men to go to China and who offers big wages, is a fraud, and we warn the railroad men of the United States to look out for him.

We give in this issue an abstract of the South Dakota railroad law, lately passed by the legislature of that state. It contains over 11,000 words and our abstract, severely brief, requires about 2,000; so that the first impression upon the reader (and, we think, a correct one) will be that in this case we have a very big law for a very small state. South Dakota has only about 1½ per cent. of the railroad mileage of the United States, but its law is 50 per cent. more voluminous than the Interstate Commerce Act. It is copied largely from the Federal Act, with such additions as the ingenuity of the Granger lawyer could devise. Merely as ingenuity, this enterprise is commendable, and the State Printer will have a fat job. Whether the State Railroad Commission will ever find the railroads such very refractory law-breakers as to lead it to invoke the powers of punishment described in the very elaborate provisions against evasion of the requirements of this Act, is another question. The phraseology, even of the most outrageous sections of the Act, shows marks of clear-headed care and caution and of a purpose not to require anything that has not been required before, somewhere; but when the law places a rigid limit on passenger fares, and plainly hints to the Commissioners that they ought to require freight to be carried in South Dakota as cheaply as on lines in other states doing ten times as much business, it gives conclusive evidence that the *spirit* of the highway robber is in the bill, howsoever dignified and technically fair its language may appear to be. The equitable enforcement of the law depends now, of course, upon the intelligence and integrity of the Commissioners; but assuming both intelligence and integrity, the question is still clouded in doubt, for public sentiment, uniformly "agin' the railroads," will overawe ninety-nine out of every hundred South Dakota men who would be likely to be chosen commissioner. The legislature has lengthened the term of the Commissioners to six years. As has been pointed out by the Commissioners of North Dakota, in their annual report, this will give a chance for each new commissioner to learn something about railroads before he attempts to rule them; but will the better tenure give him any more grit? The most prominent characteristic in many Western railroad commissions is deficient courage; they seem to see the right course which ought to be pursued in dealing with the railroads, but to be too timid to follow it.

The rate situation at the West is not materiall changed, but there are apparently well-founded rumors of reduced rates being made, and conservative traffic officers feel grave apprehension that unless Congress soon acts on the pooling bill there will be demoralization in all directions. The Eastern situation is not as precarious as the Western, for the reason that the railroads have decided, upon advice of counsel, to stand by the Joint Traffic Association agreement until the hearing of the appeal next October. Passenger rates are being affected by the payment of excessive commissions, and it would not be at all surprising if there should be serious disturbance in both Eastern and Western territory soon. There is considerable dissatisfaction over the award of the Board of Managers of the Joint Traffic Association in regard to excess fares between New York, Chicago and St. Louis, and the decision of the arbitrators to whom the matter has been referred is being awaited with interest. The supporters of the Foraker (pooling) bill are still sanguine that it will be passed at the present special session of Congress, but other well-informed persons say that it has no chance, pending the completion of the organinization of the House. The Washington correspondent of the New York *Journal of Commerce*, writing last week, said:

> There is little probability of any definite action for the regulation of railway combinations during the present session of Congress. There has been some pressure from the railways for immediate action in both houses for the passage of the Foraker pooling bill, and some of the pressure upon Speaker Reed for the appointment of the House Committees has probably come from this source. The leaders in the Senate, however, and the members of the Interstate Commerce Commission feel that the situation should be allowed to become more settled before important legislation is attempted. The Senate Committee may give hearings on the Foraker bill, but they are not likely to make a report to the Senate until after the decision of the Supreme Court in the autumn on the case of the Joint Traffic Association. The application which has been filed for a rehearing of the case of the Trans-Missouri Freight Association is understood to be due to a desire to leave the Supreme Court free to review all branches of the subject covered by its recent decision, to reverse the attitude then taken or to make distinctions between that and other cases, if careful consideration justifies such action. The real contest may be made in the case of the Joint Traffic Association, but if the decision in that case should amount to a practical reversal of some of the sweeping ground taken in the case recently decided, it might be convenient to have the latter case open for re-examination. With matters in this unsettled condition, both in the courts and in Congress, members of the Interstate Commerce Commission have not felt like promoting new legislation. If all possible combinations for maintaining good faith in regard to rates are held by the Supreme Court to be illegal they will probably favor the passage of some measure permitting pooling under their direct sanction.

Signaling at the International Congress.

Number 2 of Volume 11 of the *Bulletin* of the International Railroad Congress has just appeared, containing the report of the discussions on signaling which took place at the London Congress in July, 1895. The report of Mr. Thompson on this subject was summarized in the *Railroad Gazette* of July 19, 1895. This cannot be called fresh news, but there are numerous features of interest, if one has the patience to read through the whole discussion. Perhaps the most salient fact is that the conclusions of world's congresses, like those of some less pretentious bodies, must be taken with discretion. After a forenoon's discussion on block signaling, the presiding officer, a Russian, Mr. Kerbedz, formulated what he took to be the consensus of opinion, in a declaration that automatic and non-automatic block-signaling were both safe, and equally so; and declared it adopted by an overwhelming majority; but in the afternoon some Frenchmen who more clearly comprehended the drift of the discussion and the pronounced views of those who dissented from the conclusion, succeeded in showing that the forenoon's action did not mean much after all. And in fact it did not; for those who knew most about automatic signals said little or nothing in their favor, and the conclusion framed by the chairman of the session, on which he declared the vote, contained the meaningless addition "On single lines the automatic system can secure safety," the universal safety of both automatic and non-automatic having been already declared.

At the same time there was a lively interest in automatic signaling on the part of the continental delegates, and especially in the apparatus on the Liverpool Overhead Railroad, which is near enough to them to seem like a reality. Mr. Stiffson, of the Hungarian State railroads, was greatly interested in the electro-pneumatic signals on the New York Division of the Pennsylvania Railroad, but the report does not indicate that he got any information about them. Presumably, however, the best information at world's conventions, as at others held by railroad men, is imparted in private conversations outside the sessions. There were a half dozen Americans present at this London signaling discussion, but nothing was said by them to indicate to the Congress that the busiest four-track railroads in America are operated under the purely automatic block system, for lengths of several miles (several consecutive block-sections), and that some parts of these very busy lines have been thus operated for more than 10 years. Perhaps these gentlemen felt as did Mr. Noblemaire, of the Paris, Lyons & Mediterranean. In discussing the possible effect of a decided approval by the Congress of automatic signaling, he said: "No one wishes more than I do to see good automatic block systems discovered and put in use, but if this conclusion goes on record as the recommendation of the Congress, our shareholders will all ask why we still use the very expensive non-automatic system." Are not some shareholders in America asking this question to-day? How is it that one double-track road 100 miles long needs signalmen every few miles, and another one, very much like it, can be operated with automatic signals alone? Is it an actual or only an apparent difference in conditions which *seems* to warrant the differences in practice?

The need of better diffusion of information on automatic signaling was indicated at the Congress by the question asked by Major Marindin, Inspector of the British Board of Trade, who should be one of the best-informed men in the world, whether it was possible with automatic signals to use the ordinary semaphore. Here, as in the previous instance mentioned, no information was forthcoming, at least not in open meeting; and so far as the record goes, an Englishman is still free to assume that the full-size pneumatic semaphores on the Pennsylvania and the New York Central are six-inch toys in glass cases.

Americans were not the only unresponsive attendants at the Congress, for Mr. Ely, of the Pennsylvania, was also unsuccessful in eliciting replies to his inquiries. He asked for the results of experience with night signals worked with lights of only two colors, red and green, but the English experience under this head was not described with any clearness. The fact is that the English roads are perfectly satisfied to use red for caution in a distant signal and to let enginemen run past such signals at high speed every day. They have been doing this for forty years, more or less, the practice is universal throughout the kingdom, and the English railroads enjoy the best record in the

world for safety; and yet we Americans object to the practice in the most strenuous manner. Mr. Ely told the Congress that it would be better to continue the use of three colors, red, green and white, than to adopt a plan allowing enginemen to run past a red signal. Our English friends, if they take any interest in the matter, will tell us that we are worshiping the form of an idea while missing its substance; and it is perhaps time that we inquired whether we have any ground on which to deny such a charge.

The discussion of this subject in America has been hampered by the practical difficulty that most responsible railroad officers have believed that the evil sto be warded off were so insignificant that it would be just as well to decide the question in 1986 as 1896; and they were, therefore, content to let the discussion go on as an academic question forever. The theories have also been unfortunate. Even Mr. Carter's theory—a combination colored distant signal—which he has tried so thoroughly on the Chicago & Northwestern, does not enlist the sympathy of the Eastern roads. And yet both practice and theory favor the proposed change. It is a practical fact that red glasses have been broken and that in consequence of the breakages, dangerous signals have been given; and semaphore arms have broken off bodily, casting and all, falling to the ground and leaving the lamp intact, showing white. The experience of the Chicago & Northwestern is also a practical fact, and one too large to be ignored. The strength of the theorist's argument for using green for all-clear has been often shown in these columns. Mr. Ely, at London, emphasized the unfruitfulness of the experiments with yellow and violet; but granting all that is claimed on that point, why not use *white* for danger or caution in distant signals? We shall have little trouble in adopting green for all clear whenever the desire to do so becomes sufficiently definite to enlist a little energy in its accomplishment.

Although, as we have shown, the signaling discussion, in some of its aspects, appeared to be an occasion for asking questions which nobody would answer, there were, nevertheless, many bits of information given out. For one thing, an accident due to the breakage of a red signal glass was reported from Roumania. The policy of letting well enough alone may succeed as long as the known damage from breakages is so small that everybody will soon forget it, but if the experience of the whole world is drawn upon for argument, the sum of experience will be so large that the true conditions must appear.

Another subject, on which the Congress gives us the sum of experience of the whole world, is that of color-blindness. Mr. Motte, who gathered information on signaling for the Congress from non-English speaking countries, called attention to the fact that not a single company or administration which had reported had known of any instance of an accident being caused by the color-blindness of an employee whose duty it was to observe color signals. While, as Mr. Motte remarked, this need not hinder all reasonable efforts to get shape or form signals, in place of colors, and while, most certainly, it does not excuse the retention in the service of an engineman who cannot distinguish red from green except by the difference in intensity of the lights, or by skillful guesswork, it does show that the experience of the rest of the world coincides, in all probability, with ours; and the fact should tend to reassure those whose objection to using green and red for the two chief signal colors is based mainly on a fear of color-blindness.

Another fact brought out was that "broken couplings have spread like an infectious disease." Mr. Kerbedz made this statement, and assumed that the experience of all the members of the Congress substantiated his words. Evidently the increase of the capacity of cars and of the length of trains is not an exclusively American enterprise.

Another bit of experience was that concerning treadles or track instruments for actuating electrical signals, though, unfortunately, it was contradictory. Mr. Ramaeckers, of the Belgian State railroads, has used these with great success, some having been in service 18 years; but Mr. Chaperon, of France (P. L. & M.), his next-door neighbor, almost, has tried many patterns, and "all have gone wrong after a time." A remark of a delegate from Russia indicates that in that country signalmen work only six to eight hours a day. If that is a result of living under an absolute monarchy, some American railroaders will go in for the enthronement of a Czar here without delay.

Mr. Eddy, Manager of the government railroads of New South Wales, gave the Congress a valuable summary of his experience in signaling in that country. When he went there he found that the old-fashioned staff system was always suspended the moment a slight irregularity occurred, telegraphic orders being substituted. He introduced the electric staff and has made a great success of it. Its management is so simple that he uses it without the aid of the telegraph, so that station agents do not need to be telegraphers. He even places staff instruments at meeting places where there is no agent. At night he closes the less important staff stations and connects through, sending express trains over three or four sections without change of staff. The apparatus for exchanging staffs at high speed is already well known to readers of the *Railroad Gazette*. Mr. Eddy works telephones on the same wires with the staff apparatus. He says that staff and tablet instruments, formerly costing over $300, may now be bought for less than $150. All signals in New South Wales have been altered to show green at night for all-clear.

In a brief discussion at this point on the color question, General Hutchinson, of the British Board of Trade, remarked that an advantage of the adoption of green for all-clear in England was the abolition of the confusion which formerly resulted from back lights which were "very likely to mislead the driver." General Hutchinson also stated, in connection with automatic block signals, that on the only line in England where they are used there have been failures, not only on the side of safety, but also dangerous failures; signals showing all-right when they should have been at danger. This remark must refer, we suppose, to the Liverpool Overhead Railroad.

One Way to Get Good Service.

Men of but little practical experience (and women, too, for that matter) who love to work what they call their minds, about human affairs, are very fond of telling what the relations between employers and employed are, or are not, or ought to be or might be. After having watched the tedious and muddy flood of speculation on this subject which flows incessantly by, it is cheering to get a bit of practical experience, and such we have recently been able to observe in the Metropolitan Street Railway Association of New York.

Two or three years ago the President of that company started a club of employees which was limited in its membership at first, but grew rapidly, until now we believe it is open to all employees of the company, and in fact its rolls include a large percentage of those employees. The object of this club was to furnish a means by which the officers and the employees, from the highest to the lowest, could come together, get to know each other's faces and minds, and exchange information and opinion; and where, especially, the men could be instructed in the mechanics and operation of the system. As the club grew, larger quarters were taken, until now it occupies a large room at the Fiftieth street power house on Seventh avenue, and within the last two or three months it has been reorganized into the Metropolitan Street Railway Association, which is now not only a social club, but a mutual aid society. The President of the Metropolitan Company studied carefully the organization of similar associations, and with the co-operation of other officers and of the representatives of the men drew up a constitution and by-laws for the government of the Association.

Membership is limited to employees and ceases when a member leaves the employ of the company. The objects of the Association are: 1. To collect and disseminate knowledge of the construction and maintenance of street railroads and street railroad equipment; 2. To promote good fellowship among the employees of the Metropolitan Street Railway Company; 3. To aid its members while they are disabled, and at their death contribute aid to their beneficiaries, provided injury, sickness or death be not due to intemperance or immoral conduct.

When totally disabled by accident or sickness a member receives a dollar a day for 90 days, but the total sum of $90 is the limit that any one member may receive in one year. In case of death his beneficiary will receive $150. For these benefits and for the social privileges of the Association the members pay 50 cents a month.

The President of the Association must be the General Manager of the Metropolitan Street Railway Co. The Vice-President is elected by a majority vote of the members present at the annual meeting. The Treasurer is the Treasurer of the Metropolitan Street Railway Co. The Secretary is appointed by the Board of Trustees. The Board of Trustees consists of a chairman and six members, and the President of the Association is Chairman of this Board. The President of the Metropolitan Street Railway Co. appoints three members of the Board, one from the operating department, one from the engineering and one from the master mechanics'. The other three member are elected by the members of the Association. In all questions relating in anyway to the management of the Association the decision of the Board is final and conclusive. This Board directs the expenditures of money, fixes salaries of any paid officers, and appoints the physicians who act as medical examiners and fixes their pay. The members of the Association get free medical attendance from the physicians of the Association, and arrangements are made by which a physician can be seen not only at regular hours at his own office, but on certain days and at certain hours at the office of the Secretary of the Association.

In this association, as in the Pennsylvania Railroad relief association and others, the railroad company pays the costs of administration, including the compensation of the surgeons, and the result is that the assessments on the men are all available for relief.

The men meet frequently at the clubroom for lectures or other entertainments, and they have there a reading-room with files of technical and other papers. It is the present purpose to build for them shortly a larger meeting-room and to give them a library and to provide toilet-rooms and bath-rooms and to add a dressing-room for women, in order that the men can take their wives and friends to the public entertainments. The lectures that have been given have covered pretty well the range of construction, equipment, operation, discipline, etc., besides touching on other subjects not quite so closely connected with the daily work of the men. Last Saturday night Mr. Hirt, who was formerly associated with the engineering department of the company as mechanical and electrical engineer, gave a lecture illustrated by lantern slides showing in a good deal of detail the conduit construction for the underground electric conductors and showing also some of the apparatus. Before the lecture began a portrait of Mr. Vreeland was unveiled. This was painted for the men and paid for by them, and is intended for the decoration of their clubroom.

It was most gratifying to see the evidence of mutual confidence in each other and respect for each other and of thorough good feeling existing between the President and other officers and the men, and we venture to say that this one experiment will do more to kill populism and socialism and strikes and all manner of civil disorder than a cord of magazine and newspaper articles.

Electric Conduit Roads.

The April number of *Cassier's Magazine* contains an article by Mr. Nelson W. Perry on "Electric Traction in City Streets," in which the subject of electric conduit roads is treated at considerable length. The impression received from reading this article is unfavorable to the conduit construction not only as to first cost, but also in regard to the power actually wasted in operating the road. The data from which Mr. Perry draws his conclusions were evidently obtained during the early days of the operation of the Lenox avenue conduit line, when everything about it, the cars excepted, was in the experimental stage.

After stating that it is impossible to secure as good insulation as in the overhead construction he says: "It has been found impossible to employ the usual voltage of the overhead systems, namely, 500 volts, 300 volts being as high as anyone seems to dare to go. In the Lenox avenue conduit system in New York the voltage at the generator is 350 and at the further end of the line, 2¾ miles away, the drop or loss when 12 cars are running is 35 per cent." If this statement were true, the conduit construction would be condemned without further consideration, for, according to Mr. Perry's figures, New York is throwing away 25 per cent. more energy than would be necessary or allowable with the overhead construction, and in order to emphasize this point Mr. Perry says: "This means not 25 per cent. of its coal alone, but 25 per cent. of its manufactured product, which is a far more serious matter. It means also that 35 per cent. more of boilers, engines and dynamos must be installed, and, furthermore, it is difficult to see how satisfactory, or even tolerable, service can be gotten out of motors subjected to a variation of 35 per cent. in voltage."

These statements should not pass by unnoticed, since the facts in the case are quite different than as stated in the article. These are briefly as follows: At the outset the voltage at the generators was 350, and owing to insufficient copper the loss in transmission was abnormal, but the engineers of the company had the generators rewound to give an output of the standard voltage used in the overhead trolley work, namely, 550 volts, and at this high electric pressure the line has been operated ever since. The insulators at first used were found to be inadequate and they were replaced by others. Under the present conditions the Lenox avenue conduit line operating with a voltage of 550 at the generator has a drop or loss when 36 cars are running of 12.6

per cent. at the end of the line, which is 2⅝ miles from the generating station. This agrees very closely with accepted engineering theory for overhead trolley construction. It is safe to assume, however, that the transmission loss with the overhead wire would be found to be nearer 25 per cent. than 10 per cent.

As to the excessive amount of copper required in the feeders which Mr. Perry points out in his article, it may be well to state that on the two branches of the Lenox avenue line (8¼ miles of single track), on which are operated 36 cars, 77,600 ft. of lead-covered cable has been installed, which would figure to $3,878 per mile of single track at present prices, which amount is not excessive. Furthermore, it might be of interest to state that 6,000 insulators, such as it is proposed to use on the Sixth and Eighth avenue lines, are now in use, and the Metropolitan Traction Company has had but three failures, and the leakage is hardly appreciable even with the conduit filled with snow.

Mr. Perry also makes a comparison between the cost of the Lenox avenue line and what it would cost to put in a trolley road of the same length. In this calculation he assumes that the cost of the conduit construction would be equal to, if not greater, than the cost of the conduits on a cable road. This is hardly true. The conduits which it is proposed to put in on the Sixth and Eighth avenue lines will be both cheaper and lighter, but fully as strong as the present cable conduits on Broadway.

The Belgian State Railroads in 1895, working 2,049 miles of road with a heavy traffic, report 96 collisions and derailments during the year, 24 of which resulted in the death of 19 and the injury of 113 passengers, while of employes 5 were killed and 45 injured. Besides, 40 employes and 57 other persons were killed, 902 employees and 116 other persons injured on the lines by their own fault. For a system of little more than 2,000 miles this is so formidable a list of casualties that an error may be suspected.

The mail steamers which ply between Ostend and Dover in connection with the Belgian railroads are exceptionally good and have attracted a considerable and increasing patronage; but they are by no means a profitable enterprise, and the Belgian railroads are so short that the traffic which the boats bring them cannot be very profitable. In 1895 the expenses of the steamers were nearly four times as great as their receipts. The average expenses per trip across (71 miles) were $417; the average receipts, $105. The average loss on each passenger was $5.43.

NEW PUBLICATIONS.

The Materials of Construction. A Treatise for Engineers on the Strength of Engineering Material. By J. B. Johnson, C. E., Professsor of Civil Engineering in Washington University. Octavo, 787 pages, with numerous diagrams and illustrations; index. New York: John Wiley & Sons; London: Chapman & Hall, Limited. 1897. Price, $6.

Professor Johnson's long-promised work on the Materials of Construction is just received from the publisher and is an attractive and imposing volume, being well printed, with sufficient typographical aids to easy use, with a very full index and with an extraordinary number of diagrams for graphical representation of facts ascertained and ideas to be conveyed. The subject is treated in four principal parts. The first is a Synopsis of the Principles of Mechanics Underlying the Laws of the Strength of Materials, which is intended as a supplement to the usual course in applied mechanics in the engineering schools. Part II. treats of the Manufacture and General Properties of Materials of Construction. Part III. treats of Testing Machines and Methods of Testing. Part IV. treats of the Mechanical Properties of Materials as revealed by Tests. There are four appendices, namely, a biographical sketch of Professor Johann Bauschinger (whose portrait appears as a frontispiece); a Study of Iron and Steel by Micrographic Analysis by Prof. J. O. Arnold, of Sheffield, England; a comparison of the work of various conventions and other bodies with regard to the Testing of Metals, by Mr. L. Baclé, translated by Captain Carter, U. S. A., and Mr. E. A. Gieseler, and, finally, Specifications for Structural Steel as proposed by the American Society of Civil Engineers and by Mr. H. H. Campbell and as adopted by the Association of American Steel Manufacturers.

We defer review of this book for a later issue, intending this notice merely as an announcement of its appearance.

TRADE CATALOGUES.

Application of Paints, Varnishes and Enamels for the Protection of Iron and Steel Structures and Hydraulic Work.

Under this title, Messrs. Edward Smith & Co., 45 Broadway, New York, have recently published a third edition of a work of considerable value. It is different from most trade publications in that the greater part of its pages is occupied by papers read before various technical bodies, together with the discussion of the same, and reprinted from the publications of the societies by permission. The first of these to appear is an abstract of a paper by A. H. Sabin, on "Preservative Coatings for Iron Work," read at a meeting of the New England Railroad Club. This is followed by extracts from the discussion of a paper on the "Painting of Iron Structures Exposed to the Weather," read before the American Society of Civil Engineers, by E. Gerber. The remaining paper in the book is on "Experments on the Protection of Steel and Aluminum Exposed to Sea Water," by Mr. Sabin, and is reprinted, with its discussion and correspondence, from the Transactions Am. Soc. C. E. A few additional remarks by Edward Smith & Co., regarding their durable metal coating, complete the work. The book is standard 6 × 9 in., and contains 69 pages of printed matter together with over 20 pages of half-tone illustrations printed on heavy calendered paper.

The Bates Machine Co., Joliet, Ill., sends us a pamphlet illustrating the Cookson combination feed-water heater, purifier, filter and oil separator and also the combination feed-water heater, purifier, filter, oil separator and condensation receiver, to which new features have recently been added. It shows the construction of the heater in detail and points out the improvements which enable the company to guarantee these heaters to perform a large amount of work economically. According to the claims, the temperature of feed water will be within four degrees of the exhaust steam at the heater, there is no back pressure, and any size heater can be cleaned within an hour. The heaters are made for boilers ranging from 25 to 1,500 H. P., and larger sizes will be made if ordered.

Rail Bonding and the Protected Rail Bond.—A small 3 × 8-in catalogue, carefully complied, has been issued by the Forest City Electric Co., of Cleveland, O. Attention is directed to the advantages of protected rail bonds in that they do not oxidize and cannot be stolen. A word is spoken in favor of short bonds and diagrams are given showing in detail the construction of those made by the Forest City Electric Co. The improved Cleveland bond welder is also illustrated and its advantages enumerated. The company's guarantee to users, a price list and a table of "useful data" are found on its closing pages.

Steel Portland Cement.—The Illinois Steel Co., Chicago, sends out a pamphlet under the title of Steel Portland Cement, designed to advertise the cement made by that company from blast furnace slag. The pamphlet is made up mostly of letters from contractors and builders who have used this cement. These letters have all been written within about a year, and they are from architects and contractors of experience and reputation, and the evidence given as to the qualities of this cement is valuable.

Compressed Air on the Chicago Drainage Canal.—The Ingersoll-Sergeant Drill Co., Havemeyer Building, New York City, has issued a little pamphlet to illustrate the applications of compressed air in the work of the Chicago Drainage Canal, where, as is well known, it was used very extensively and in some novel ways. The pamphlet will be found interesting and worth filing as a record.

Wire Fencing.—The McMullen Woven Wire Fence Co., Chicago, publishes a catalogue of its steel wire fence, which is made in a number of different designs adapted for railroad use, lawns, farms, etc.

On Two Cents Per Mile Passenger Rates.

(*Continued from page* 309.)

and financial standing of the company were not at that time very good, but by spending the earnings on the road, instead of taking them in dividends, it was speedily brought to a comparatively high state of perfection. Its capital account to-day is 35 millions. It paid last year, and for some years previously, 8 per cent. to its stockholders. The road cannot be duplicated to-day for 70 millions. In any talk about watered stock the Chicago & Alton must be left out. Its stock has not only not been watered, but it has been boiled down. To day the road and equipment has cost twice as much as its capital account represents. If we were paying dividends to-day on the actual amount invested, instead of that amount boiled down, we would not be able to pay 2 per cent. Practically, therefore, the Chicago & Alton is paying its stockholders to-day less than 2 per cent.

I do not say that you can sell the Chicago & Alton to-day for 70 millions instead of the 35 millions for which it is capitalized, but I do say that it has cost its shareholders 70 millions, instead of the 35 millions at which it stands in the books of the company.

Its depot properties and facilities in the cities from which, to which, and through which it runs, added to its other properties, would treble or quadruple its present capitalization. But who would buy it to-day at its value based on what it pays, or what it has cost to the shareholders, or what its valuable terminal and intermediate depot privileges would cost if they had to be purchased to-day? What incautious buyer would have the amazing, the superlative, temerity to put money into an enterprise against which adverse legislation and poisoned public prejudice is incessantly and relentlessly directed?

I have served railroads for over 50 years. I do not own one share of railroad stock, and, to-morrow, if I were a millionaire several times over, I would not invest one dollar in railroad stock. I would put it into farms or other real estate which legislation and public prejudice have not as yet attacked.

It is surely not a sin to earn 4 or 8 per cent. per annum. A man goes into saloon business with a capital of $100 or less, and earns thousands a year. Nobody claims that he should not be permitted to do so. Nobody claims that he should only be permitted to have a certain rate of interest on the original investment, instead of the large earnings which he obtains. The same is true of farming, of manufacturing, and of all the industries in the country. I do not suppose that any member of this committee, or any member of the Legislature of Illinois, would be in any particular hurry to enter into a business which would pay him only the small percentages which railroads are paying. Why should you make any difference between a railroad shareholder and a farmer, a manufacturer, a wholesale dry goods man, a groceryman, a saloon keeper, or anyone engaged in any industry of any kind? They are all men, citizens and voters, and should be treated alike, and no exceptional or special legislation should apply to any of them.

As to the ability of the Chicago & Alton to stand a two-cent rate: I have already quoted from the report of the Interstate Commerce Commission that the Chicago & Alton for some years has not been receiving per passenger per mile as much as the Interstate Commerce Commission report shows it costs to carry a passenger. The Chicago & Alton has the reputation of being the best local passenger railroad in the state of Illinois, having more large towns to serve, and therefore better earnings from passenger train service. Notwithstanding that, hardly one of our strictly local trains is at the present time paying the average cost of operation. For the year 1896 the average cost of running our passenger trains was about 70 cents per mile; for 1895 it was 74 cents per mile, and for 1894 it was a little over 75 cents per mile. These figures are below the actual cost, because we did no work upon the road or on cars or locomotives that could be avoided. We spent just as little money as was possible to keep the road in operation. In good times, under normal conditions, a fair average cost per mile for each passenger train would be at least 85 cents per train mile. We have had prepared a statement of train earnings from Feb. 16 to March 11, 1897, as follows:

No.	Between	Miles.	Trip average	Per mile
				cents.
1	Chicago and East St. Louis ...	280	197.42	71
2	Chicago and East St. Louis.....	280	197.15	70
17	Springfield and Bloomington...	59	21 04	35
18	Springfield and Bloomington...	59	34.15	58
19	Bloomington and Girard.....	84	36.51	43
20	Bloomington and Girard.....	84	34.74	39
21	East St. Louis and Springfield.	96	66.26	69
22	East St. Louis and Springfield.	96	59 61	62
39	Alton and Jacksonville.....	67	32.05	48
40	Alton and Jacksonville	67	32.96	49
69	Roodhouse and Jacksonville....	21	17.22	82
70	Roodhouse and Jacksonville....	21	14.88	71

This statement shows that the majority of these trains earn considerably less than the average cost of operation, and they are trains which are carrying passengers at the highest rate per mile, which we are now able to obtain under the law and against competition. The figures given are conclusive that not one of these trains could be operated on a basis of two cents per mile, and every one of them would have to be withdrawn.

A legal rate of two cents per mile involves an average rate of 1⅞ or 1¾ cents per mile. I have already explained how through rates are made from and to points east and west, and north and south of us, and that involves that we shall be unable to obtain two cents on business between our terminal points, which in turn involves that we shall have to grade our rates for many miles nearest to each terminal point to all other terminal points and to several intermediate points. It also involves changes which the general public and the legislatures will hardly view with complacency. It will compel us to run fewer trains and to employ fewer men. We will have to dispense with great numbers of trainmen, trackmen and shopmen, and it appears impossible to see how we can avoid making reductions in wages, and what will follow that you can foresee quite as clearly as any other body.

If we were not in this through business, we could not afford to run the number of trains which we now run. The Chicago & Alton has high repute as a local line, and without endorsing all that is said about that, I may admit that we have a good local business, but if we depended upon that alone we would probably be compelled to run only one train in each direction daily, instead of the ample facilities in the way of transportation which we now give. It is the through business which enables us to maintain our position, pay fair wages, afford good train service, and make some returns to owners of the property.

In every other business except railroad business the buyer and seller stand on common ground and have equal rights. It is only when the railroad comes into the market that the buyer claims to have the right to dictate terms to the seller. Why this should be so is one of those things "which no fellow has ever found out." So far as the Chicago & Alton is concerned, the buyer would have been just as well off to-day if he had been left to deal with the seller, instead of having been embarrassed by legislation. I am not aware of any reduction in passenger rates on the Chicago & Alton which has been brought about by legislation. It came about naturally in the way of business through competition.

If you decide on a two-cent rate for any set of lines in Illinois, you will at the same time force a two-cent rate on all other lines in Illinois and compel reductions which

will be forced over more lines than those in Illinois, and will be more far-reaching than we can see at the present time. If any line in Illinois has a two-cent rate, all other lines will be compelled to meet it, as they cannot compete to common points at three cents per mile against a line charging only two cents per mile. The idea that strong lines can have a two-cent rate and weak lines can charge three cents or more is fallacious. The weak line charging a high rate cannot carry a single passenger against a strong line charging a lower rate. Under such conditions the weak line would be destroyed, and the strong line would be scarcely able to exist, even by reducing the number of its trainsand its employees and cutting down wages. I do not believe, as some do, that such legislation would make the strong stronger and the weak weaker. I believe that it would literally destroy the weak, and would make the strong weak.

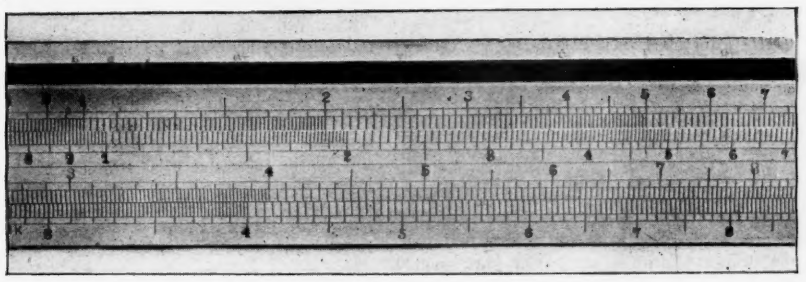


Fig. 17.—Side-Rule Setting for Rail Elevation.

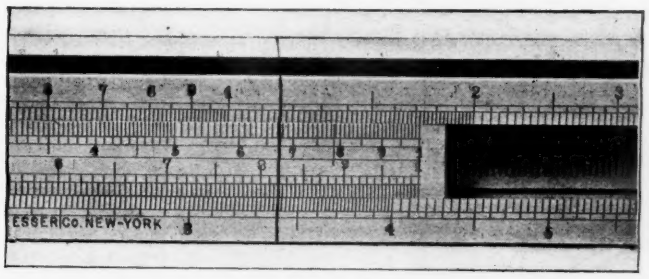
The Slide Rule as an Aid to Railroad Field Work.*

BY GEORGE DUNCAN SNYDER.

Assoc. M. Am. Soc. of C. E., City Engineer, Williamsport, Pa.)

(Continued from Page 241.)

To Re-Run the Curves of an Established Line.—In re-running the track centers of an established railroad the slide rule can be used to great advantage. Where the intersection point of the tangents is accessible, the degree of curve can readily be obtained by measuring the external secant on the ground and obtaining the degree of curve, as in one of the preceding cases. Where the P. I. is inaccessible, many engineers, where no reliable notes exist, deflect to the center of the track at each station between the tangents, and then plot these results and project a curve on paper. This is then run on the ground. With this method two trips to the curve are necessary, and the curve will rarely be found to fit the track exactly, and it is very objectionable when a continuous track survey is being made. So it will be found to be much preferable to run a trial curve, from which the necessary calculations to obtain a curve to fit the track can be made on the slide rule with the loss of scarcely any time.



Ftg. 20 —Slide in Position for Offsets.

The first necessity is to obtain approximately the degree of curve. This can be done by stretching a chain along the inside of the outer rail and taking the middle ordinate at a number of points along the curve. The degree of curve corresponding to the ordinates thus obtained can be found on the slide rule by setting the index opposite 218, when the degrees, expressed decimally, will be found opposite the ordinates given, in feet and tenths, for a 100-ft. chord, or by using a chord of 62 ft. the ordinates will be found to be 1 in. per degree of curve.

Having ascertained the degree of curve approximately, the instrument is placed over a trial P. C., the position of which is judged by eye; and the curve is run for five or six stations. If this does not diverge much from the center line of track, the curve is continued until the next tangent is reached, and the instrument is placed over a trial P. T. and sighted parallel to the tengent as defined by the track and the total angle thus obtained. The distance that it is necessary to shift the curve at the P T. is then obtained, and the shift for the P. C. is calculated on the rule, and the curve is again run. If the curve diverges considerably in the first five or six stations, the P. C. is shifted to bring the curve right that far and is then continued to the tangent.

Example 1.—A curve is found by ordinates to be about 6 deg. The point *A*, Fig. 14, is judged to be the P. C. from which a curve is run for 775 ft. to *B*, which is judged to be about the P. T., and which point is found to be 12 ft. from the tangent as marked by the track. The instrument is then placed at *B*, and turned to tangent, but is found to diverge from a tangent parallel to the track. So the angle *E B O* is measured and found to be 1 deg. 16 min., which is subtracted from the total angle consumed up to *B*, 46 deg. 20 min., leaving 45 deg. 14 min., the total angle of the curve. The point *C* is then set, and a distance taken from *C* to the line of tangent of the track, which is found to be 11.8. Now set 45 deg. 14 min. on scale of sines under 11.8; under index will be found 16.6, which is the distance the new P. C. must be ahead of the old one. Suppose that a distance was taken from the trial curve to the track at station 4, and found to be 6.7 ft. A 6 deg. curve in 400 ft. consumes 24 deg. With the slide still in the same position as before, over 24 deg. will be found 6.75, which shows that the curve will practically fit the track.

Example 2.—Let the full line in Fig. 15 represent the center line of the track, and let the dotted line represent a trial 3 deg. curve that has been run for 800 ft. At station 8 it is 6 ft. from the center lines, and at station 4 it is 7.2 from the center line. This indicates that the trial P. C. is not far enough ahead, and that the trial curve is not sharp enough: so a new degree of curve and the position of the new P. C. must be obtained. A 3 deg. curve in eight stations consumes 24 deg. Set 24 deg. on scale of sines under 6 on scale *A*; over 12 deg. the angle consumed at station 4 will be found 3.07, which will be the distance the line will be moved toward the track at station 4 if the P. C. is shifted to make station 8 coincide with the center of the track. Station 4 was originally 7.2 ft. from the center of the track. Consider 3.07 = 3.1 and subtract this from 7.2; the result is 4.1, which is the distance station 4 will be from the track if the curve is shifted. Next obtain the external secant of a 3 deg. curve for 800 ft. The formula is ex. sec. = R tan ½I, tan ¼I.

$$R = 1{,}910 \quad \tfrac{1}{2}I = 12°, \quad \tfrac{1}{4}I = 6°.$$

Set index of scale of tangents over 1910, move runner to 12 deg., set index to runner and under 6 deg. will be found 42.7. The external secant of the curve to fit the track should be 4.1 less than the above; 42.7 — 4.1 = 38.6. Set 6 deg. over 38.6, move runner to index, set 12 deg. to runner; under index will be found 1725, the radius of the new curve, which consider a 3 deg. 20 min., being 0 deg. 20 min. sharper than it was before, 20 min = 0.333 deg. Then using formula 0 = ⅓n D^o set 875 on *B* under the index of *A*: under 333 will be found 291. Set 291 under index of *A*, and over 8 on *D* will be found 18.6 on *B*, which is the distance a 3 deg. — 20 min. curve would diverge from a 3 deg. curve in 800 ft. The 3 deg. curve was already 6.0 ft. out at station 8, and 18.6 + 6 = 24.6, so a shift must be obtained for a 3 deg. 20 min. curve for 800 ft. for a throw of 24.6. Set 26 deg. 40 min. on scale of sines under 24.6; over index will be found 54.7, which is the distance the 3 deg. 20 min. curve must be started ahead of the P. C. of the 3 deg. curve.

Example 3.—Let the full line, Fig. 16, represent the track, and the dotted line the trial curve, which is a 6 deg. curve for 7 stations, striking 5 ft. too far inside the curve at station 7, and 3 ft. too far outside the curve at station 3, and 1 ft. too far outside at station 4. This indicates that the trial curve is too sharp, and that the P. C. is too far ahead. Assume that the trial curve is 2 ft. too far toward the outside at the middle point of the arc. Then set 42 deg. on scale of sines under 5; over 21 deg. will be found 2.7, which added to 2 ft. makes 4.7, the total correction that must be added to the external secant of the 6 deg. curve. To obtain external secant, set index of scale of tangents over 955, the radius, move runner to 21 deg., move index to runner; under 10 deg. 30 min. will be found 68.1. 68.1 + 4.7 = 72.8 = the external secant. Set 10 deg. 30 min. to 72.8, move runner to index, set 21 deg. to runner; under index will be found 1022, which is the radius of about a 5 deg. 36 min. curve, and is 24 min. flatter than the trial curve. 24 min. = 0.4 deg. Set 875 on *B* under index of *A*; under .4 will be found .35. Set .35 under index; over 7 on *D* will be found 17.2 on *B*, which is the distance a 5 deg. 36 min. curve will diverge from a 6 deg. curve in 7 stations. The 6 deg. curve was 5 ft. too far toward the inside of the curve; subtracting this from 17.2 leaves 12.2, the distance the 5 deg. 36 min. curve will be too far toward the outside of the curve. A 5 deg. 36 min. curve consumes 39 deg. 12 min. in 700 ft. Set 39 deg. 12 min. on scale of sines under 12.2; over index will be found 19.3, which is the distance the 5 deg. 36 min. curve must be started back of the P. C. of the 6 deg. curve.

In fitting the curves to the track of an established line by projecting the curves from a map, to obtain accurate results, the map has to be plotted on such a large scale and with such care that the curve can be fitted to the ground much quicker by trial, as described above.

Elevation of the Outer Rail.—The elevation of the outer rail can be readily obtained on the slide rule from the following formula for standard gage:

$$e = \frac{V^2 D^o}{1{,}500}$$

in which e = elevation in inches, D^o = degree of curve, and V = velocity in miles per hour. The setting is as follows: Over the velocity in miles per hour on *D*, set the constant 1,500 on *B*; then over any degree of curve on *B* will be found the corresponding elevation on *A*. For instance, to obtain the elevation at a speed of 40 miles an hour, set 1,500 on *B* over 40 on *D* (see Fig. 17), then the elevation will be found on *A* over any degree of curve on *B*. Thus, the elevation for a 3-deg. curve is found to be 3.2, that for a 4-deg. curve is 4.25, etc.

The best way to elevate the outer rail of curves on a portion of road where the maximum speed is about the same, is to elevate all the curves at a uniform rate until a maximum of 6 to 8 in. is reached, then give all the sharper curves, that would theoretically require a greater elevation, the maximum elevation, and supply the trainmen with a list showing the maximum speed permissible on these curves, or erect posts at these curves with the maximum speed painted on them.

On a road having a maximum elevation of 8 in. what is the maximum speed allowed on a 10-deg. curve? Set 10 on *B* under 8 on *A*; under 1,500 on *B* will be found 34.6 on *D*. For a 9-deg. curve set 9 under 8, and under 1,500 on *B* will be found 36.5, etc.

TRANSITION CURVES.

Many systems of running transition curves have been published recently, but they have not come into general use for the reason that they either require an elaborate system of tables, or else the formulæ are so complicated and the staking them out adds so much to the field work as to make them impracticable. By using the following methods, all the necessary data for running a transition curve can be obtained on the slide rule in a few minutes.

Fig. 18 shows a curve with transition curves at the ends. This method employs, in common with most others, a transition curve that is practically a cubic parabola. In using such a curve, the main curve is run from the P. C., as curves are usually run, except that the P. C. is offset a certain distance, *O*. The transition curve *L* bisects this offset at the P. C., and one-half the transition curves lies on each side of the P. C. To determine the length or offset of transition curve in terms of the degree of curve, we have Froude's formula (See Rankine's *Civil Engineering*, page 652, and Henck's *Engineers' Field Book*):

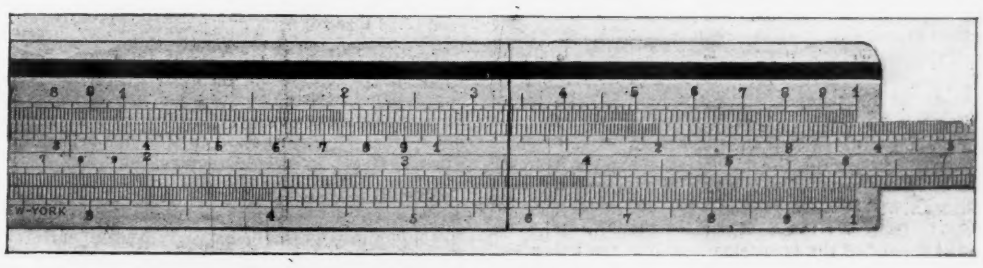


Fig. 21.—Slide-Rule Setting.

$$O = \frac{L^2}{24\,R}$$

Substituting $\frac{5730}{D^o}$ for R we obtain

$$O = \frac{L^2\,D^o}{137520}$$

and

$$L = \sqrt{\frac{137520}{D^o}}$$

The offsets of a cubic parabola from a tangent or from a circular curve increase as cube of the distance. Thus the offsets of points 1, 2, 3, 4, Fig. 19, either from the tangents or from the curve, would be as 1, 8, 27, 64

The work of calculating a transition curve on the slide rule is shown in the following:

* Copyrighted, 1897, by George Duncan Snyder.

Example.—Given an 8-deg. curve with an offset from its tangents of 6.72, to make the necessary calculations for a transition curve to be run by offsets.

The length of transition curve must first be obtained. For this the constant 137520 in the formula may be considered 137500 in slide-rule work.

The setting in the preceding problem is as follows: Set 8, the degree of curve, on scale *B* under 1,375 on *A;* then under the offset 6.72 on *B* will be found 340 on *D*, the length; see Fig. 20. With the slide in this position it forms a table of offsets and lengths for an 8-deg. curve, and the following general rule will be found to apply to all cases.

Set the degree of curve on scale *B* under 1375 on scale *A;* under any offset on scale *B* will be found the corresponding length of transition curve on scale *D;* and conversely over any length of transition curve on scale *D* will be found the corresponding offset on scale B.

One-half the length of transition curve, 340 ft., will be on each side of the P. C. or P. T. Divide this half length, 170 ft., into any number of equal parts, say five of 34 ft. each, and the location of five intermediate points on the transition curve will be obtained as follows: The offset at the P. C. will be $\frac{1}{3}$ *O*, or 3.36; then set $5^3 = 125$ on *B* under 3.36 on *A;* see Fig. 21.

Then over $(1)^3 =$ 1 will be found 0.027 = 1st offset.
" " $(2)^3 =$ 8 " " " 0.215 = 2d "
" " $(3)^3 =$ 27 " " " 0 725 = 3d "
" " $(4)^3 =$ 64 " " " 1.72 = 4th "
" " $(5)^3 = 125$ " " " 3.36 = as before.

These same offsets from the tangent can be used from the curve by using them in inverse order and in opposite direction.

The field work of running the above curve by this method would be as follows: With the instrument on the tangent, the point of the transition curve is first set; from this point 34 ft. is first measured off and a point located .027 ft. from the line of the tangent; 34 ft. more is then measured off and a point located .215 ft. from the tangent, and so on until the half length of the transition curve is set. At the P. C. a point is set 3.36 ft. from the line of the tangent, and another point is set 6.72 from the line of the tangent; the former is for use in lining the track and the latter is the P. C. from which the curve is run. The instrument is then set over this point and sighted parallel to the tangent, and a deflection is made for an 8-deg. curve for 34 ft., which is found on the rule to be 1 deg. 21½ min.; 34 ft. is then measured off and a point is set 1.72 ft. toward the outside of the curve from the range of the instrument; 2 deg. 34 min. is then turned through, and 34 ft. more measured off, and a point set 0.725 ft. from the range of the instrument, and so on, until the end of the transition curve is reached, when with the instrument still at the P. C., the main curve can be continued as far as desired. In running from the curve to the tangent the method of procedure is reversed.

To Obtain Apex Distances when Transition Curves are Used.—When the tangents of a transition curve are run to an intersection, the formula to obtain apex distances becomes (see Fig. 22):

$$\text{Apex Dist.} = (R + O) \tan \tfrac{1}{2} I.$$

This can be solved either on the slide rule or a table of the functions of a 1-deg. curve can be used; in which case the side *AB* of the little triangle *ABC* must be obtained on the slide rule, and added to the result obtained from the table.

Example: Given, curve = 8°, $O = 4.52$, $I = 58° - 26'$, $R = 716.3$. $R + O = 716.3 + 4.5 = 720.8$

By logarithms,

Log. 720.8 = 2.85781.
tan 29° − 13′ = 9.74762
2.60543 = 403.1, the apex distance required.

On the slide rule the work would be as follows:

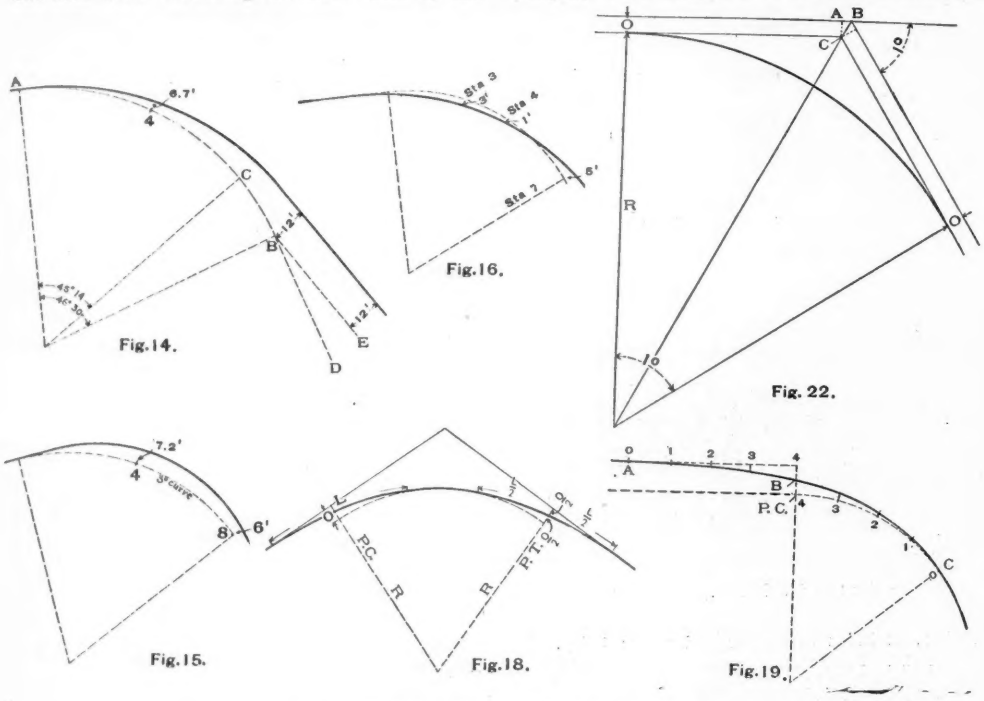
Set the index of the scale of tangents over 720.8; under 29 deg. − 13 min. will be found 403. With table of functions of a 1-deg. curve, it would be:

Apex distance of 8-deg. curve for 58 deg. 26 min. = 3,204.5
÷ 8 = 400.6.

To this add the side *AB*, which is equal to $O \tan \frac{1}{2} I$. Set index of scale of tangents over 4.52; under 29 deg. 13 min. will be found 2.53.

400.6 + 2 5 = 403.1, as before.

(TO BE CONCLUDED.)



The Application of the Slide-Rule to Field Work.

TECHNICAL

Manufacturing and Business.

H. B. Coho & Co., dealers in electric machinery, have removed their offices from 203 Broadway to the St. Paul Building, 220 Broadway, New York City.

Thomas Carlin's Sons, of Allegheny, Pa., have received an order to furnish a complete contractor's plant of large capacity and original design to be used in the construction of United States government fortifications. The equipment will include special long span traveling cranes and hoisting engines, concrete mixers and conveyers of new design, a large steam power plant and 20 ammunition hoists and cranes.

The Wilmington Malleable Iron Co. has opened an office at 1120 Monadnock Block, Chicago, for the purpose of pushing the "Little Delaware" coupler in the West. The office will be in charge of A. J. You.

The Pneumatic Gate Co., of 100 Washington street, Chicago, has lately erected gates for the Pennsylvania Company at the intersection of Washington avenue and Sedgwick street, Allegheny City, Pa. This is a very wide crossing, and six gate posts were required, with 12 arms. The compressed air for operating the gates is brought from the company's engine-house near by.

The Universal Construction Co., of Chicago, has elected Edward Haupt, formerly Secretary, President, to succeed W. R. Stirling, resigned. A. J. Singer becomes Secretary and Treasurer.

The Ryan-McDonald Mfg Co., of Baltimore, Md., has completed the building of 16 20-H. P. double cylinder, double drum hoisting engines for use in the Jerome Park and Croton Aqueduct improvements. The company denies that it has received an order for 40 hoisting engines, as stated by a contemporary.

Bement, Miles & Co., of Philadelphia, Pa., has received a contract to furnish two double frame 2,500 lbs. steam hammer for the Louisville & Nashville Railroad.

Edward L. Perry, formerly President of the Peerless Rubber Mfg. Co., has organized the La Favorite Rubber Mfg. Co., of Paterson, N. J. In addition to other rubber materials, the company will manufacture a red packing known as Perry's packing.

The Niles Tool Works Co., of Hamilton, O., has received an order from the Chicago Shipbuilding Co. for the following machinery: One heavy horizontal boring and drilling machine, one 72-in lathe, one 22-in lathe, one 16-in. shaper, one 16-in. slotter, one 50-in. drill and one 30-in drill.

The Brown Hoisting & Conveying Machine Co. Cleveland, O., will build a 58-ft. span electric traveling crane of 25 tons capacity for the Chicago Shipbuilding Co.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received a contract to furnish and erect the steel work for an addition to the plant of the Victoria Paper Mills Co., at Fulton, N. Y.

The Brookland Electric Street Railroad, of Columbia, S. C., is in the market for rails. John T. Sloan, Vice-President, should be addressed.

It is stated that the Missouri Pacific and St. Louis, Iron Mountain & Southern roads are asking bids for furnishing ties for five years from Jan. 1, 1898 Bids close May 15.

The Garlock Packing Co, manufacturer of the Duo and other packings, of Palmyra, N. Y., has recently opened an office in Cleveland, O.

The Rand Drill Co., of New York City, through James F. Lewis, Manager of the Chicago office, last week sold one of its large duplex air compressors to the Cleveland Shipbuilding Co.

Benjamin Watson, dealer in railroad supplies, has removed his office from 33 Wall street to the Coffee Exchange Building, 66 Beaver street, New York City.

Iron and Steel.

Prices of pig iron are still low and stock continues to increase. The stoppage of 15 furnaces in March was offset by the starting of a number with larger capacities. The output for the first quarter of this year was 2,134,886 gross tons and the consumption is estimated at about 2,000,000 gross tons, or about 25 per cent. less than for the corresponding period of 1896.

The Homestead Steel Works of the Carnegie Co. during the past month broke all records in the production of open-hearth steel, turning out 49,491 tons of basic metal. The best daily record was 2,137 tons.

The Pittsburgh Forge & Iron Co., operating the Porkhouse Mill, at Allegheny, Pa., has reduced the wages of puddlers to $4 a ton.

The Oliver & Snyder Steel Co. is preparing plans for an additional blast furnace to be built next to Edith furnace, in Allegheny.

The Cambria Iron Co.'s furnace at Graysport, Blair County, Pa., is to be abandoned by the company.

The Pennsylvania Steel Co. is preparing to operate Lochiel furnace at Harrisburg, Pa., which it holds under lease.

It is announced that the entire plant of the Maryland Steel Co., at Sparrow's Point, will resume operations on May 3. The mills and furnaces have been repaired during the last two months.

At a recent meeting of the stockholders of the Central Iron & Steel Co., held at Harrisburg, Pa., the following officers were elected: President, Charles L. Bailey; Vice-President, James M. Cameron; Treasurer and General Manager, G. M. McCauley; Secretary, S. B. Bande.

At the annual meeting of the Sloss Iron & Steel Co., at Birmingham, Ala., on April 27, the following Directors were elected: E. W. Rucker and Solomon Haas, Birmingham; Joseph Bryan and E. D. Christian, Richmond; J. C. Maben, W. H. Goadby, W. E. Strong, Henry Mortimer, and John A. Rutherford, New York.

New Stations and Shops.

The new passenger station of the Baltimore & Ohio, at Baltimore, Md., which is to take the place of the old Camden station, is being rapidly pushed to completion. It is expected that the train shed will be ready for use by May 1, and that the rest of the building will be completed by June 1. The total cost will be about $100,000. The station was described in our issue of May 15, 1896.

The new freight depot which is being built by the Union Pacific at Greeley, Col., will be 28 × 80 ft. in size. The building will have a stone foundation and walls of pressed brick. The stone work is being done by Thomas Hayes, of Denver, and the brick work by W. W. Hull & Co., of Denver. The remainder of the building will be built by the railroad company. The cost of the building will be about $3,000.

Best Metal for Cylinders, Valves and Valve Seats.

The Master Mechanics' Committee appointed to write a report on the best metal for cylinders, valves and valve seats, requests information on the following points: Tests of special material in either cylinders, valve or valve seats, and the results. Recommendation of any special mixtures of iron for these purposes. Information as to the relation between cracking of cylinders and hardness of iron. Specifications as to hardness of the mixture of metal. The committee would be glad to have any other suggestions on the subject. Replies should be addressed to Mr. J. N. Barr, Chairman, Supt. M. P., C. M. & St. P. Ry. Co., Milwaukee, Wis., by May 1.

Some Properties of Acetylene.

Julius Pintsch, the inventor of the Pintsch gas lighting system, has recently made extensive experiments on the action of acetylene on cylinders of different composition. He filled five steel cylinders with a mixture of 80 per cent. of acetylene and 20 of coal or fat gas, poured some water into the cylinders, inserted various metals and alloys and exposed the cylinders for nearly a year in an open shed to heat and frost. Most of the metals were unattacked; lead, zinc and particularly copper and its alloys were, however, acted upon, but no explosive compounds were formed, and from these and other experiments with dry gases the conclusion was drawn that explosive copper compounds will not be formed unless there is ammonia present. Further experiments made by him relating to the explosive property of acetylene showed that mixtures with gases can also explode on heating, but the explosion takes place at considerably higher temperature than 780 deg. C., at which temperature acetylene decomposes under explosion in the absence of oxygen. It was also found that mixtures

with less than 70 per cent. of acetylene are as safe as ordinary gas, and that explosions occur more readily in large vessels when the gas is compressed than in narrow tubes filled with gas under the ordinary pressure.

Open-Hearth Steel Driving Brakeshoes.

The cut represents the Sargent-Stevens open-hearth steel driving brakeshoe made by the Sargent Co, Chicago.

The shoe is designed on experience gained by several years of observation, which has proved the value of extending the flange bearing part of this shoe, as shown. The advantages claimed for this design are an increased wearing action on the flange, by which the outline of the tire is more nearly preserved, and increased holding power by reason of the longer grip on the flange. In addition to these a longer life and better service are believed to be secured, because the long bearing on the flange steadies the shoe in position, preventing the wear of the brake rigging. In the Sargent-Stevens shoe the proper relation between the tread and flange bearing surfaces to insure the best results, both as regards wear of the tire and effective performance, has been sought

THE SCRAP HEAP.

Notes.

The Lake Shore & Michigan Southern has given notice that it will withdraw from the Toledo Joint Car Inspection Association on June 1.

The sub-committee of the Interstate Commerce Committee of the United States Senate, which is considering the proposed pooling laws, has decided to hold no public hearings at present

Heavy rains fell in Southern and Western Iowa the latter part of last week, and numerous washouts were reported on the Burlington, the Wabash, the Chicago Great Western and other railroads.

The Postal Telegraph Cable Co. has made 25-year contracts with the Mexican National and Mexican Central railroads for conducting through telegraph business beweenMexican cities and all parts of the United States and Europe.

At Gloucester, Mass., on a recent holiday a local passenger train of the Boston & Maine had to take on about 100 bicycles. It took 13 minutes to load them and two baggage cars were required. The train lost 17 minutes at the stations where these wheels were taken off.

President E. B. Thomas, of the Erie road, being a loyal son of Ohio, last week sent to the authorities at Columbus an offer to transport a delegation of the militia of that state to the Grant monument celebration in New York free of charge. The offer was accepted and the Erie ran four special trains, consisting altogether of about 33 cars, to carry the soldiers. Seven cars were taken from Marion, 12 from Cleveland, 9 from Springfield and Dayton and 6 from Mansfield. The total number of soldiers was about 1,100.

The United States Court at Chicago has granted the injunction asked for against the enforcement of the Indiana law reducing street car fares in the city of Indianapolis to three cents, and the company has re-established the old rate of five cents. The decision by Judge Showalter holds that the so-called Hugg law is unconstitutional, because it is special legislation, applying only to the city of Indianapolis. The suggestion that this Court ought not to consider the case until the Supreme Court of Indiana has pronounced upon the law, the Court says, is one which it has no right to entertain.

The New York Legislature has passed the grade crossing bill, the measure providing for the appropriation by the state of $100,000 yearly to promote the abolition of grade crossings, which has been recommended by the State Railroad Commissioners for several years. It has also passed a bill increasing the Railroad Commission from three to four members. There is little doubt that the Governor will approve the crossing bill, but he is understood to be opposed to the enlargement of the commission. The Legislature of Connecticut has rejected a bill repealing the Bridgeport grade crossing legislation of 1895. It is said that this will tend to stop the existing strife between the city and the railroad, and lead to early action on the improvements in that city. An elaborate bill for the creation of a railroad commission is now before the Legislature of Florida, and competent judges say that its passage is assured. It authorizes the commission to prescribe freight rates, and in many respects is similar to the South Dakota law, published in another column of this paper.

Second-Story Entrance to Stores.

A Chicago paper states that arrangements are being made in connection with the Union Loop of the elevated railroads in that city, to make entrances direct from the platforms of stations to the second stories of drygoods stores and other business houses near the stations. The reporter has a mental image of connections of this kind at dozens of places, and of elevated sidewalks extending some distance beyond the platforms of the stations, but the only fact he gives is that "arrangements are being made" at one store, that of A. M. Rothschild & Co., Van Buren street. As, according to the plans, many, if not all, of the elevated trains using this loop will run completely around it, each station, without regard to which side of the track it is upon, will be both an up and a down station; that is to say, a passenger coming to a store on the train of a certain line can begin his return trip, if he choose, at the same station, on the same side, simply taking a longer or a shorter ride on the loop before beginning the home journey proper.

Indiana Crossing Law.

Hon. A. C. Daily, Auditor of the state of Indiana, has issued a circular announcing the provisions of the new law of that state regulating the crossing of railroads at grade. It went into effect on March 8. Under this law a new crossing of one railroad with another, if not made by agreement between the two companies, must be considered by the Circuit Court of the county, the judge of which must ascertain how it can best be made and issue a decree defining the mode of crossing, and if it be reasonable and practicable to avoid a grade crossing the Court shall, by process, prevent a crossing at grade. At existing crossings, including crossings of standard and electric railroads, and including drawbridges, the erection of suitable interlocking, approved by the auditor, will make it lawful for trains to cross without first making a stop; but the auditor may rescind his approval, after hearing, and in such case the law requiring trains to stop shall again apply. Where two railroads cross (or a standard and an electric road), either road, if unable to agree with the other, may petition the auditor to issue an order, and he, after a hearing, shall grant or deny the petition; if it is granted he shall prescribe what is to be done, fix the time within which the appliance shall be put in, apportion the expense of construction and operation. Any railroad or electric road hereafter desiring to cross the track of another railroad at grade must put in interlocking at its own expense, and it must also bear the expense of maintenance and operation. This clause does not apply to crossings of side tracks only. Neglect or disobedience of this law is punishable by a fine of $500 a week. The auditor may appoint a competent civil engineer to examine plans.

Extension of the Electric Service at the B. & O. Tunnel.

Arrangements have been completed whereby the electric locomotives which on their northbound trips have heretofore been detached from the trains at the Mt. Royal station at the north end of the Baltimore tunnel, will continue with the trains to Waverly, which is at the top of the heavy grade, two miles north of the northern end of the tunnel. The main object of this extension of electric service is to enable the trains to make better time up the grade.

Industrial Exposition of the Mechanics' Institute, San Francisco.

The thirtieth industrial exposition of the Mechanics' Institute, of San Francisco, Cal., will be held in that city from Aug. 17 to Sept. 18 inclusive. Heretofore, these expositions have been confined chiefly to exhibits showing the progress of California in art, science, mechanics, agriculture and horticulture; but it is proposed to enlarge the scope of the exposition this year and receive exhibits from all over the country. It will be held in the Mechanics' Pavilion, a building of two stories, covering a whole block adjoining the City Hall, and in the center of the city. It has floor area of 3½ acres and is easily accessible by all car lines. Exhibitors will be aided by generous concessions and a liberal management. Power for machinery, space, water and lighting will be free to exhibitors. The Mechanics' Institute has a membership of nearly 5,000 and the proceeds of these fairs are expended in paying premiums and in the building up and maintenance of a large and growing library, free lectures and classes, and the dissemination of knowledge. Ernst A. Denicke is President and E. P. Heald Recording Secretary, 31 Post street, San Francisco, Cal.

Cars on the Brooklyn Bridge.

A bill has passed the State Senate providing that the trustees of the New York & Brooklyn Bridge may contract with any street, surface or elevated railroad company to run cars from Brooklyn to New York across the bridge without charging an increase in fare over which the company that receives the contract now charges for one continuous ride on its lines.

Chesapeake & Ohio Piers Destroyed by Fire.

As we go to press we learn that piers 5 and 6 of the Chesapeake & Ohio Railroad at Newport News, Va., were burned down on April 27, together with a large quantity of freight. Two steamships, one sailing vessel and a tugboat were also burned, and the total loss is said to be over $1,000,000.

Trolley vs. Storage Battery Roads.

The following is from the *Electrical Engineer* of London: "The directors of the Hanover tramway system have published an important report, in which they narrate their experience with accumulators as the source of the power for their cars. In Hanover both overhead wires and accumulators have been used for a considerable time, so that the managers are in a position to institute a reliable comparison. Taking everything into account they pronounce in favor of the storage cell. The cost of maintenance, they say, has been determined for the year 1896, and the average comes out at 40 marks per wagon per month, equivalent to 75 groschen per kilometer (12 cents per car mile). The estimate includes the cost of renewing the plates. Having regard to the expense involved in the maintenance of the overhead line and its accessories, as well as to other circumstances, the managers reach the conclusion that the additional cost of accumulators does not exceed one-tenth of a penny per mile. Consequently it has been decided that the entire system shall, as soon as the requisite arrangements can be made, be driven by secondary batteries."

Telegraphing Without Wires.

Electrical Engineering for April contains a short article on "Telegraphing Without Wires," by Mr. L. L. Summers, which has the air of a mild criticism on an article in *McClure's Magazine* for March, by Mr. H. J. Dam. Mr. Dam's article is simply a report of an interview with Dr. Jagadis C. Bose, recently Professor of Physics at Calcutta, and with a young Italian, Guglielmo Marconi. Both of these scientists were reported as having telegraphed without wires and the article is very apt to prove misleading. Mr Summers points out the fact that although Dr. Bose has contributed a number of papers during the last two years before the Asiatic Society of Bengal and also a paper last February before the Royal Institute, all bearing on the subject of electric waves, yet there was nothing published in any of these articles that would warrant the epoch-marking claims set forth in *McClure's*. In regard to Marconi's experiments, the fact is pointed out that not enough details are given to know in what way these are related to the efforts of the earlier workers and especially to the work of the British government along these lines. From what has been published it appears that Marconi has not accomplished anything beyond the results which have already been obtained. In view of the above facts, it would be well to hear more in detail of the work of these and other experiments, before concluding that the problem has been successfully solved on a large scale.

Stop and Look and Listen.

A recent decision in the Pennsylvania Supreme Court is of interest to bicycle riders. Damages were claimed for the death of a person while crossing a railroad track. The deceased was riding a bicycle, and when he came to the railroad, at a point having four tracks, a freight train was passing, for which he had to wait. He did not dismount, but made what was called a 'bicycler's stop," by circling on his wheel round and round, at a distance of from five to ten yards from the track, and when the train passed he started across without dismounting, and was struck and killed by a train coming in the opposite direction on another track. Justice Mitchell held that it was the duty of the deceased to stop and dismount, and refused to entertain the proposition that circling round and round constituted a legal stop. "Considering the ease of dismounting and the control of the rider over his instrument, a bicycler must, under all ordinary circumstances, be treated as subject to the same rules as a pedestrian. He must dismount, or, at least, bring his wheel to such a stop as will enable him to look up and down the track and listen, in the manner required of a pedestrian."

The Budapest Underground Railroad.

The Budapest underground electric railroad, or rather electric subway, for it is under the street pavement only and not under *ground*, had during the six months of the Millennial fair last year a traffic averaging 14,760 passengers daily, carried in 335 car round-trips daily over the 1.43 miles of railroad. After the closing of the exhibition, from the beginning of November till the middle of January, the traffic averaged 7,530 passengers daily, carried by 306 car round-trips daily. The traffic during the fair averaged 44 passengers per car trip; since, to less than 25.

LOCOMOTIVE BUILDING.

The Gulf & Ship Island has received the last of three new engines from the Baldwin Locomotives.

We are informed that there is no truth in the report that the Chesapeake & Ohio has ordered 21 new engines.

The Richmond Locomotive Works has received an order to build two locomotives for the Seaboard Air Line.

The Lake Superior & Ishpeming has purchased three shifting engines from J. T. Gardner, Rookery Building, Chicago.

The Baldwin Locomotive Works built and shipped to Brazil two rack locomotives for the Principe do Grao Para Railroad.

The Southern has placed an order with the Richmond Locomotive Works for two heavy passenger and 10 consolidation locomotives, with 21 × 28-in. cylinders.

The Baldwin Locomotive Works last week delivered 13 new mine locomotives for use in the Ashland, Gilberton, Shenandoah, Pine Grove and surrounding collieries, in Pennsylvania.

The Canadian Pacific is building at its shops two heavy engines for use in the mountain districts, three compound 10-wheel freight engines for the Pacific Division, six 10-wheel passenger engines for the Western Division, six 10-wheel passenger engines for the Eastern Division, and four compound 10-wheel freight engines.

CAR BUILDING.

The Georgia Railroad is asking bids on 300 freight cars.

The Brakenridge Lumber Co., Ltd., New Orleans, La., is in the market for three 4-ft. gage logging cars.

The Chesapeake & Ohio has recently completed an air brake instruction car. The car is also equipped for instruction in the use of lubricators, and it is expected to later add a steam heating equipment.

The 100 cars for the Louisville, Evansville & St. Louis, referred to in our last issue, will be hopper bottom gondolas of 60,000 lbs. capacity, 34 ft. long and be equipped with 33-in. Washburn wheels, diamond trucks and Westinghouse air-brakes.

The Wason Manufacturing Co., Brightwood, Mass., has delivered two passenger cars to the Spokane Falls & Northern, and has under construction four more for the same road. It is also building four combination passenger and baggage cars for the New York & Greenwood Lake Division of the Erie, to be delivered May 20.

We recently noted the fact that the Canadian Pacific was equipping 500 freight cars with Westinghouse air-brake and had arranged to spend $300,000 a year for three years in equipping other rolling stock with Westinghouse appliances. We now learn that in addition to the locomotives noted in a preceeding paragraph, the road is now building at its Hochelaga shops two combination passenger and baggage cars, two smoking-cars and 12 baggage and express cars, all 56 ft. in length, over bodies and equipped with Trojan extension platforms, Consolidated steam heating system. Westinghouse air signals and quick action brakes, Acme chandeliers fitted for electric lights. They will be mounted on the company's standard four-wheel trucks with 40-in. Krupp steel tired wheels and inside hung brakes, and have National hollow brake beams. One hundred standard 35-ft. refrigerator cars, of 20 tons' capacity and ten 40-ft. furniture cars of 30 tons' capacity, all equipped with Westinghouse air-brakes and Hein couplers and 60 dump cars, operated by compressed air, are being built at Perth. The company is also rebuilding one sleeping, two dining, two first-class passenger and two baggage and express cars.

J. B. Ledger, of Gulfport, Miss., who is about to contract for 2½ miles of electric street railroad, will want several cars

The Brookland Electric Street Railroad, of Columbia, S. C., John T. Sloan, Vice-President, is in the market for some new cars. The road is under construction.

BRIDGE BUILDING.

Alma, Mich.—The Board of Arcade Township has let the contract for a 140-ft. iron bridge over Pine River, two miles west of here, to Ramsey & Co., of Port Huron, at $2,000.

Catawissa, Pa.—James S. Patterson, of Philadelphia, has been appointed engineer of the Catawissa bridge to prepare plans and specefications for that structure.

Cementon, Pa.—A petition asking the Court for a new county bridge across Spring Creek, near Spring Mill, is being circulated.

Cumberland, Md.—The Commissioners of Alleghany County, Md., and Mineral County, W. Va., have visited the Patterson's Creek site for a new proposed bridge over the Potomac River at that point. They have not yet decided at which point the bridge will be built, the above or the Wiley's Ford site.

Dennison, O.—Bids are wanted May 14 for an iron bridge over Stillwater Creek, between here and Urichsville. E. C. Brown, County Auditor, New Philadelphia, O.

Easthampton, Mass.—The contract for a new bridge over Manhan River has been given to the Berlin Iron Bridge Co. for $2,096.

Ithaca, Mich.—The Ann Arbor Railroad will build a 70 ft. girder bridge on its main line between here and Alma. G. A. Nettleton, Chief Engineer, Toledo, O.

New York.—The State Senate has passed a bill providing for the building of bridges over the tracks of the New York Central and the New York & Putnam railroads at Gerard and Walton avenues.

Northfield, Mass.—There is a proposition to build a bridge across the Connecticut River at this place, and a bill to authorize it has been passed in the Lower House of the state legislature. The bill was passed, however, by a narrow majority, and it is said that it will meet opposition in the Senate.

Philadelphia, Pa.—The Secretary of War has passed upon the objections to the new bridge over the Schuylkill at Gray's Ferry, and has issued a permit for the building of the bridge. Chief Webster, of the Bureau of Surveys, will, it is said, be ready to advertise for bids for the building of the bridge in a few days.

Temperanceville, Pa.—The plans have been completed for a new trestle on the Pittsburgh, Cincinnati, Chicago & St. Louis at this place, which will cost $20,000. The Panhandle crosses Sawmill Run over a trestle 700 ft. long. Most of this has been renewed during the past few years, until all but 150 ft. is of steel.

White Haven, Pa.—The Commissioners of Carbon and Luzerne counties have decided to have a new bridge built over the Lehigh River at Lehigh Tannery, two miles below this place. A meeting of the Commissioners of the two counties will be held May 17 to consider plans.

Williamsport, Pa.—The County Commissioners have appointed H. C. Reeder, engineer, to draft plans for the new bridge across Loyalsock Creek at Montoursville.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cincinnati, Hamilton & Dayton, quarterly, 1¼ per cent. on the new preferred stock, payable May 8.

Great Northern, quarterly, 1¼ per cent. on preferred stock, payable May 1.

Lake Erie & Western, quarterly, 1¼ per cent. on preferred stock, payable May 15.

Rome, Watertown & Ogdensburg, 1¼ per cent., payable April 30.

New Orleans & Carrollton (*New Orleans*), quarterly, 1½ per cent., payable April 20.

St. Charles Street (*New Orleans*), quarterly, 1½ per cent., payable April 14.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 25.

Central Railroad of New Jersey, annual, Jersey City, N. J., May 1.

Chateaugay, annual, Plattsburgh, N. Y., May 29.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 5.

Delaware & Hudson Canal Co., annual, 21 Cortlandt street, New York, May 11

Delaware, Maryland & Virginia, annual, Georgetown, Del., May 26.

Elmira & Lake Ontario, annual, 20 Whitehall street, New York, May 6.

Flint & Père Marquette, annual, Saginaw, Mich., May 19.

Lake Shore & Michigan Southern, special, Cleveland, O., and Erie, Pa., May 20.

Louisiana & Missouri, annual, 216 N. Broadway, St. Louis, Mo., May 6

Michigan Central, annual, Detroit, Mich., May 6.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 19.

New York Central & Hudson River, special, Albany, N. Y., May 26.

New York, Chicago & St. Louis, annual, Cleveland O., May 5.

New York & Harlem, annual, Grand Central Depot, New York City, May 18, and special meeting at the same time and place.

Northern (New Hampshire), annual, Concord, N. H., May 27.

Philadelphia & Reading, annual, Twelfth and Market streets, Philadelphia, May 3.

Southern Pennsylvania Railway & Mining Co., annual, Broad street station, Philadelphia, Pa., May 3.

Union Pacific, annual, Boston, Mass., April 28.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *National Convention of Railroad Commissioners* will be held at St. Louis, Mo., on May 11, 1897.

The *Association of American Railway Accounting Officers* will hold a convention at Richmond, Va., on May 26, 1897.

The *Association of Railroad Claim Agents* will hold their next meeting at the Southern Hotel, St. Louis, May 26, 1897.

The *Association of Railway Claim Agents* will hold its convention at St. Louis, Mo., during the last week of May, 1897.

The *Canadian Electrical Association* will hold its convention at Niagara Falls, Ont., June 2, 3 and 4. Hotel Lafayette will be the headquarters of the association.

The *Master Car Builders' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 8, 1897.

The *National Association of Local Freight Agents' Associations* will hold a convention at Washington, D. C., on June 8, 1897.

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *Train Despatchers' Association of America* will hold a convention at Detroit, Mich., on June 22, 1897.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds in formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' Club of Columbus*, (*O.*), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

Western Society of Engineers.

The Western Society of Engineers will hold its next regular meeting on Wednesday evening, May 5, at the Technical Club, Chicago. Mr. Stanton B. Peck, Chief Engineer of the Link-Belt Machinery Co., will present a paper on the subject "Rope Transmission."

Master Mechanics' Convention.

Mr. W. S. Morris, Superintendent of Motive Power, Chesapeake & Ohio, has been put on the Committee on Arrangements for the next meeting of the American Railway Master Mechanics' Association. The other members of the committee are Mr. R. H. Soule, Norfolk & Western, and Mr. S. A. Crone, New York Central.

Independent Order of Railway Conductors.

The seventh annual meeting of this organization was held in Hoboken, N. J., on April 13. This brotherhood was formed in New England by conductors who object to the striking proclivities of the members of the old conductors' brotherhood. The officers elected at Hoboken were: President, F. A. Hermance, New Haven, Conn.; Vice-President, T. H. Cook, Springfield, Mass; Secretary, E. B. Kenyon, New Haven. The Chairman of the Insurance Committee is J. L. Woodruff, Westfield, Mass.

Engineers' Society of Western Pennsylvania.

The regular monthly meeting of the Engineers' Society of Western Pennsylvania was held in the rooms of the society, 410 Penn avenue, Pittsburgh, Tuesday evening, April 20. A paper entitled "Transmission of Power by Compressed Air" was read by Mr. Richard Hirsch, who compared this method of transmission of power with the various other methods in vogue, and gave a detailed estimate of the cost of a plant with a capacity of 1,100 H. P. if erected in Pittsburgh. Some of the statements in his paper were the subject of very animated discussion by the members of the society, in which advocates of the gas engine and electricity took a prominent part.

The question of the requisite qualifications and appropriate salary of the Director of Public Works for the city of Pittsburgh, as provided in the proposed new charter, was discussed and a committee was appointed to appear before the proper legislative committee and state the views of the society on the desirability and necessity of providing that this office be filled by an engineer well qualified by education and wide experience.

Engineers' Club of St. Louis.

At the last regular meeting of the club, held at 1600 Lucas Place, St. Louis, Wednesday evening, April 21, at 8 p. m., Col. E. D. Meier read a paper entitled "A National Boiler Inspection Law." A review was given of the present status of boiler laws and boiler inspection, and a plea was made for the passage of a national boiler inspection law, the execution of which is to be entrusted to a bureau of the new Department of Commerce and Industries. The discussion which followed was participated in by Messrs. Ockerson, Barth, Baier, Flad and Corey. Mr. Robert Moore made a few remarks on the death of William Ezra Worthen, honorary member of the club, and presented the following resolution which was adopted: "*Resolved*, That the Engineers' Club of St. Louis has learned with great regret of the death of William Ezra Worthen, an honorary member of this club, and we desire hereby to express our appreciation of his high attainments as an engineer and his noble traits as a man, and to tender to his family our sympathy in their great loss." Col. E. D. Meier followed with a few remarks on the life and attainments of Mr. Worthen.

The Engineers' Club of Philadelphia.

A regular meeting of the club will be held on Saturday, May 1, 1897, at 8 o'clock p. m. The paper of the evening is on "The Superstructure of the Delaware River Bridge at Philadelphia," by Mr. Paul L. Wolfel. (Illustrated by the electric lantern.)

The meeting of the club held April 17 was called to order by Vice-President Carl Hering at 8.15 p. m. There were 66 members and visitors present. Mr. Charles F. Scott (visitor) presented the paper of the evening upon the "Installation of the Niagara Falls Power Company." With the aid of photographic views, projected by the electric lantern, he described the means by which the above-named company has already developed 15,000 H. P. (which will be increased to 100,000.)

Dr. Coleman Sellers, in discussing this paper, stated that the magnitude of the hydraulic and electrical units in this installation made it necessary to devise new plans for all of the apparatus. The design for the turbines was made in Switzerland, but all other plans were made in this country under the advice of a commission of American and foreign experts and all the machinery was built here. The production of power in great quantity at so cheap a rate has created new methods of manufacture, and there is every indication that the demand for power will increase with the growth of this plant.

Western Railway Club.

The Western Railway Club held its regular monthly meeting on Tuesday, April 20, at the Auditorium Hotel, Chicago. Mr. Wm. Forsyth, Mr. John W. Cloud and Mr. F. W. Sargent were elected trustees of the library presented to the club by the late Mr. David L. Barnes. The committee appointed at the last meeting read resolutions on the death of Mr. George Royal. The paper on "Car and Locomotive Lubrication," presented by Mr. George W. Cushing at the March meeting, was discussed. The discussion was principally on the failure of the lubricator to properly feed oil to the steam chest when using high boiler pressures. Mr. A. E. Manchester, Assistant Superintendent of Motive Power, Chicago, Milwaukee & St. Paul, described, in a written discussion, experiments he had made with a device placed on the steam chest which, acting as an ejector, forced the oil from the lubricator into the steam chest, thus preventing the accumulation of oil in the feed pipe. Mr. J. N. Barr, in discussing car lubrication, strongly advocated the use of filled instead of solid journal brasses.

The discussion of the paper on "Specifications for Malleable Iron Castings" was deferred until the May meeting. A paper was presented by Mr. Wm. Forsyth on "The Cost of Locomotive Repairs and the Efficiency of Machine Tools in Railroad Shops," and a report was presented by the committee, consisting of Messrs. C. H. Quereau, E. M. Herr, J. N. Barr and Profs. Wm. F. M. Goss and Storm Bull, appointed in October, 1896, on the subject of "The Apprentice Boy." Both the paper and the report will be discussed at the next meeting.

The report of the committee appointed to consider the revision of the Interchange Rules was discussed and certain changes will be recommended to the Arbitration Committee of the Master Car Builders' Association.

PERSONAL.

—Mr. E. L. Trowbridge has been appointed Assistant Engineer of the Cleveland, Lorain & Wheeling.

—Mr. B. A. Strange, who was at one time Secretary and Treasurer of the Buena Vista & Ellaville Railroad, died recently at New Smyrna, Fla.

—Mr. S. T. Pender, General Freight and Passenger Agent of the Carolina & Northwestern, was killed by a train at Lincolnton, N. C., April 22.

—Mr. John J. Koch has been appointed Division Freight Agent of the Pennsylvania Co., with headquarters at Pittsburgh, Pa., to succeed Mr. J. P. Orr, promoted.

—Mr. L. B. McGuire, Master of Trains of the Atlanta & West Point, with headquarters at Montgomery, Ala., has resigned, and will be succeeded by Mr. P. T. Downs.

—Mr. Albion L. Grandy has been appointed Assistant Engineer of the Chicago & West Michigan, with headquarters at Grand Rapids, Mich., to succeed Mr. J. F. Deimling, resigned.

—Mr. Theodore A. Havemeyer, Vice-President of the American Sugar Refining Co., who died at his home in New York City on April 26, was a Director of the Long Island Railroad Co.

—Mr. W. J. Ryus has been appointed General Claim Agent of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., to succeed Mr. C. M. Foulks, who has resigned on account of ill health.

—Mr. W. T. Kelley has been appointed Roadmaster of the Kansas City, Pittsburgh & Gulf, with headquarters at Shreveport La. He will have supervision over the road between Shreveport and Marry, La.

Mr. C. F. Blue, who for the past 10 years has been Roadmaster of the Illinois Central, at Jackson, Tenn., has been appointed to a similar position with the Mobile & Ohio, with headquarters at Murphysboro, Ill.

—Mr. P. M. Halloran has been elected Auditor and Treasurer of the Butte, Anaconda & Pacific, with headquarters at Anaconda, Mont., to succeed A. H. Melin, resigned to accept service with another company.

—Mr. E. Fisher has been appointed Engineer of Bridges and Buildings of the Missouri Pacific, with headquarters at Pacific, Mo., to succeed the late Superintendent of Bridges and Buildings, Mr. R. M. Peck, deceased.

—Mr. James F. Deimling, Assistant Engineer of the Chicago & West Michigan, has resigned to take charge of the engineering and maintenance of way department of the Lake Superior & Ispheming, with headquarters at Marquette, Mich.

—Mr. A. D. Stiles, of Omaha, has been appointed Traveling Passenger Agent for the Union Pacific, with headquarters at Salt Lake City, to succeed Mr. D. S. Taggart, recently appointed Traveling Freight Agent of the Oregon Short Line.

—Mr. J B. Cable, District Superintendent of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has resigned, and will be succeeded by Mr. William W. Collins, formerly Division Superintendent of the Chicago, Milwaukee & St. Paul, at Milwaukee, Wis.

—Mr. J. D. Landis has been appointed Purchasing Agent of the Philadelphia & Reading, with headquarters at Philadelphia, Pa., to succeed Mr. Albert Foster, deceased. Mr. Landis has been Assistant Purchasing Agent of the company for the last five years.

—Mr. J. S. Talbot, formerly Assistant General Freight Agent of the Iowa Central, with headquarters at Peoria, Ill., has been appointed Assistant General Freight Agent of the Wisconsin Central, with headquarters at Milwaukee, Wis., to succeed Mr. T. A. Price, deceased.

—Mr. D. Atwood died at his home in Chicago on April 23. Mr. Atwood was for nearly 20 years in the service of the Chicago, Rock Island & Pacific, his last office being that of General Freight Agent of the lines west of the Missouri River. He resigned that office at the beginning of this year on account of failing health.

—Mr. C. P. McCully, Chief Clerk of the Transportation Department of the Pennsylvania Railroad, Philadelphia, has just recovered from a severe attack of appendicitis and has returned to his desk. Mr. McCully had to undergo a surgical operation and was confined to his house for nearly two months.

—Mr. W. O. Sprigg, Superintendent of the Staten Island Rapid Transit Railroad, with headquarters at St. George, S. I., has resigned, and has been succeeded by Mr. W. J. Sharp, formerly Trainmaster of the Chicago Division of the Baltimore & Ohio at Garrett, Ind. We understand that Mr. Sprigg has accepted a similar position on the Southern Railroad.

ELECTIONS AND APPOINTMENTS.

Altoona & Beach Creek.—The stockholders of this company, formerly the Altoona, Clearfield & Northern, have elected officers as follows: President, W. S. Shellenberger; Vice-President, W. S. Lee; Secretary and Treasurer, S. J. Westley. Directors: W. J. Heinsling, Andrew Kipple, W. S. Lee, Walter Adams and William Loudon.

Chesapeake, Ohio & Southwestern.—The holders of the first-mortgage consolidated bonds have elected Alexander G. Hackstaff a Trustee, to fill the vacancy caused by the death of Josiah A. Horsey.

Chicago, Burlington & Quincy.—J. F. Deems has been appointed Master Mechanic at the West Burlington, Ia., shops, to succeed C. W. Eckerson, deceased. James A. Carney has been appointed Master Mechanic at Beardstown, Ill., to succeed Mr. Deems.

Cincinnati, Saginaw & Mackinaw.—At the annual meeting held recently at Saginaw, Mich., the present Board of Directors was re-elected. Officers were elected as follows: President, A. W. Wright; Vice-President and General Manager, Charles M. Hays; Secretary and Treasurer, James H. Muir.

Mohawk & Malone.—At the annual meeting of stockholders, held in Albany, N. Y., April 21, the present Board of Directors was re-elected.

New York Central & Hudson River.—At the annual meeting of stockholders held in Albany on April 21, the present Board of Directors was re-elected, with the exception of H. McK. Twombly, who was elected to succeed Sherman S. Jewett, deceased.

Norfolk & Western.—R. P. C. Sanderson has been appointed Master Mechanic of the line east of Roanoke, with office at Roanoke, Va. H. A. Gillis has been appointed Master Mechanic of the line west of Roanoke, with office at Roanoke. Both appointments took effect on April 20.

Northern Pacific.—Oscar Vanderbilt, formerly District Passenger Agent at Des Moines, has been appointed City Passenger Agent in St. Paul. C. C. Mordaugh has been appointed District Passenger Agent, with headquarters at Des Moines, to succeed Mr. Vanderbilt.

Pittsburgh, Bessemer & Lake Erie.—The Auditor's Department has been moved from Meadville, Pa., to the Carnegie Building, in Pittsburgh. It is understood that the other officers at Meadville will be moved later.

Quakertown & Easton.—The officers of this company, which is building a road in Pennsylvania between the points named, are: President, John Jameson, Quakertown; Treasurer, James H. Shelly, Richlandtown; Secretary, H. S. Funk, Springtown.

Quincy, Omaha & Kansas City.—C. H. Spencer, formerly Assistant General Manager, has been transferred to other duties, and the office of Assistant General Manager has been abolished. C. E. Soule has been appointed Superintendent, with headquarters at Quincy, Ill.

Staten Island Rapid Transit.—The following appointments have been made, to take effect May 1: W. J. Sharp, Superintendent, vice W. C. Sprigg, resigned: F. J. Rotheroe appointed Engineer of Maintenance of Way.

Union Pacific.—F. B. Choate, Agent of the Freight Department at Sacramento, Cal., has been transferred to Salt Lake City, Utah. F. H. Plaisted, Traveling Freight Agent at San Francisco, has been transferred to Salt Lake City.

Waco & Sabine Pass.—The officers of this company, recently incorporated in Texas, are: President, James B. Baker; Vice-President and General Manager, R. P. Duncan; Treasurer, W. W. Seeley; Secretary, John T. Battle.

West Shore.—At the annual meeting of stockholders held in Albany on April 21 the present Board of Directors was re-elected.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Carolina & Northwestern.— It is stated that this company, formerly the Chester & Lenoir, has arranged to build the section of the road between Newton and Hickory, N. C., 10 miles. The road is narrow gage and extends from Chester, S. C., to Lenoir, N. C., trains being run over the tracks of the Southern between Newton and Hickory. G. W. F. Harper, Lenoir, N. C., is President of the company.

Chicago & Northwestern.—It is announced that the branch of this road from Gillett, Oconto County, Wis., north 57 miles to a point a few miles south of Cavour, Forest County, on the Minneapolis, St. Paul & Sault Ste Marie, will be put in operation May 1. Grading was completed in July, 1896. It is expected that it will be still further extended next year from its present terminus north about 30 miles to Saunders, Mich.

Chicago, Fort Wayne & Eastern.—Preliminary surveys are now being made for this road, which is proposed to extend from Fort Wayne, Ind., east to Kankakee, Ill., a distance of 140 miles, connecting with the Findlay, Fort Wayne & Western at Fort Wayne and with the Illinois Central at Kankakee.

Delaware Central.—A charter has been applied for in Delaware for this company, which proposes building a railroad from Seaford, Sussex County, on the Nanticoke River, east about 28 miles to Lewes, on Delaware Bay. It is also proposed to run a line of steamships from Lewes to New York. The capital stock of the proposed company is $500,000, and the incorporators are: R. W. G. Welling and Robert E. McConnell, of New York; Charles Wright, Isaac Fooks and W. B. Welling.

Lyons & Chicago.—Articles of incorporation of this company were filed in Chicago, April 21. It is proposed to build and operate a road from Lemont, Cook County, Ill., northeast to Chicago. The capital stock of the company is $100,000. The incorporators are: F. R. Knowlton, R. Shearson, F. F. Paratis, S. C. Casac, and Mark Bresdon, Jr., all of Chicago. The principal office is at Chicago.

Montgomery, Hayneville & Camden.—The contract for building the first 25 miles of this road from Montgomery, Ala., has been let to Gianini & Co., of Pittsburgh, Pa., the contract being contingent on the raising of a subscription of $20,000 in aid of the enterprise by the citizens of Montgomery. The proposed road is to extend from Montgomery southwest to some point on the Gulf of Mexico, passing through Hayneville and Camden. President S. D. Bloch expects that the road will be completed to Camden, 75 miles, this season. It is proposed to issue $1,400,000 of five per cent. 30-year bonds.

Pochuck.—This company was incorporated at Albany, N. Y., April 23, with a capital stock of $20,000, by William J. Turner, W. W. Kurtz, Simon Pfaelzer, John W. Mofley and Max Bamberger, of Philadelphia, Pa. It is proposed to build a road from a point on the New York and New Jersey state line, near Glenwood, Sussex County, N. J., north about 3½ miles to a point on the Lehigh & New England Railroad between Liberty Corners and Wilcox, N. Y.

Quakertown & Easton.—Grading on this road, which is proposed from Quakertown, Pa., in a general northeasterly direction, 22 miles to Easton, has been completed for about two-thirds of its length from Quakertown. The line will pass through Richlandtown, Springtown and Rieglesville. Between Quakertown and Rieglesville is a rich farming district. It is proposed to make connection at Quakertown with the North Penn branch of the Philadelphia & Reading. The names of the officers of the company are given in another column.

San Antonio & Gulf.—Contracts have been let for an extension of this road from Sutherland Springs, Tex., 8½ miles east, toward Galveston. When this portion of the road has been completed it is proposed to let contracts for a further extension to Galveston. The total distance from San Antonio to Galveston is about 175 miles. The road now extends from San Antonio to Sutherland Springs, about 28 miles.

San Francisco & San Joaquin Valley.—Tracklaying on this road has been completed from Fresno, Cal., south to the Kings River, 22 miles, and grading has been completed for several miles beyond the river toward Hanford. It is expected that with the exception of this bridge over the Kings River the road will be completed to Hanford, 28 miles from Fresno, by May 15.

Valdosta Southern.—It is believed that this road will now be completed to Madison, Fla., its proposed southern terminus. The road was projected a number of years ago, from Valdosta, Ga., south 27 miles, to Madison, and 12 miles from Valdosta was built. At a recent meeting of the citizens of Valdosta, $23,000 was subscribed toward the completion of the road. Surveys have been made to Madison. J. M. Wilkinson, Valdosta, Ga., is President of the company.

Waco & Sabine Pass.—This company was recently incorporated in Texas to build a railroad from Waco in a general southeasterly direction to a point near Sabine Pass, about 240 miles. The capital stock is $250,000. Preliminary surveys are now being made and it is proposed to build a portion of the line this year. The names of the officers are given in another column.

Washington County.—Work is still suspended on this proposed railroad in Maine on account of failure to place the bonds. A survey of the entire line has been made and seven miles have been graded at Machias and 10 miles at Calais, Washington County. The proposed route is about 120 miles long, and extends along the Atlantic Coast through Washington County in the eastern portion of Maine. The citizens of Washington County have raised $500,000 toward the enterprise, and negotiations are now under way in New York to secure $1,500,000 more.

West Shore (Cal.).—It is expected that work on this road will be begun some time during the coming summer. The proposed road is to extend from San Francisco south to Santa Cruz. Preliminary surveys have been made. The route will follow the coast line closely. President R. S. Thornton states that construction work will be begun as soon as right of way for the entire line has been obtained.

Wiscasset & Quebec.—A circular has recently been prepared and sent to the stockholders setting forth a proposed arrangement for extending the road from Albion to Burnham, Me. The plan which has been approved by the directors provides for the organization of a separate company, to be known as the Construction & Security Co., with a capital stock of $33,330, to build and equip the extension to Burnham; payment to be made by $100,000 of the capital stock of the railroad company and the repayment within three years of the cost of construction. This $100,000 will be secured by first mortgage three-year bonds of the railroad company. The road now extends from Wiscasset, Me., northeast 40 miles to Albion, Me., connecting with the Maine Central at Wiscasset.

Wisconsin, Inland Lakes & Chicago.—This company filed articles of incorporation in Wisconsin on April 27. It is proposed to build a road from Chicago, northwest to Rhinelander, Wis., with branches to Madison and Milwaukee, a total of about 500 miles. The capital stock of the company is $5,000,000, and the incorporators are: Bayard Taylor, Chicago; E. R. Bryant, Princeton, Ill.; William J. Marks, Jesse B. Barton and George E. C. Johnson, Chicago.

Electric Railroad Construction.

Andover, Mass.—The Selectmen have granted the franchise for the Lawrence & Reading Street Railway Co. to build an electric road from Andover to North Reading, a distance of about seven miles. The distance by rail is now about twelve miles.

Attleboro, Mass.—The Norton & Attleboro Street Railway Co. has been incorporated with a capital stock of $40,000 by D. E. Saunders, of Salem, Mass.; L. C. Powers, of Somerville, Mass., and others, to build an electric road 5½ miles in length.

Aurora, Ill.—The Aurora, Yorkville & Morris Railway Co. has been incorporated to build and operate a street railroad in Kane, Kendall and Grundy counties. Among the incorporators are V. A. Watkins, H. P. Horde and F. D. Winslow. Capital stock, $10,000.

Bradford, Pa.—Surveys have been made and the right of way obtained for the Olean, Rock City & Bradford Electric Railroad. The length of the proposed line is 20 miles. Chief Engineer, H. L. Pierce, Leominster, Mass.

Buffalo, N. Y.—Tracks have been laid on O'Neil street south toward the river road, with the purpose of continuing the line of George P. Smith's electric railroad down to Niagara street and along the river road to the Grand Island ferry. On April 13 a certificate of incorporation was filed with the County Clerk of the Buffalo, Niagara River & Grand Island Railway Co., which proposed to build an electric road, practically covering the same route as the new connecting road.

The Board of Public Works has approved of the franchise for a new line made by the Council to the Crosstown Street Railroad Co.

Chatham, Ont.—A by-law has been voted to grant a franchise to the Chatham City & Suburban Railway Co. to construct an electric railroad and an electric plant.

Chicago.—It is announced that the General Electric Railway Co. has awarded the contracts for building six miles of its lines south of Thirty-first street. Active work will begin in a few days.

Connellsville, Pa.—The Connellsville, New Haven & Leisenring Street Railway will be extended to Vanderbilt, passing through the coal lands of the H. C. Frick Coke Co.

Dedham, Mass.—A hearing was given by the Dedham Selectmen on April 23, for location on some of the principal streets asked for by the West Roxbury & Roslindale Railroad Co., and the matter has been taken under advisement.

Doylestown.—It is officially stated that the money for the construction of the road has been furnished, and that the work of laying tracks will be immediately begun. Doylestown Borough Council has granted the Bucks County Railway Co., which is pushing the line from Willow Grove, an extension of six months' time on the privilege of laying tracks upon certain streets. The petition of the East Penn Traction Co. for trolley concessions was also considered favorably.

Eau Claire, Wis.—The Chippewa Valley Street Railway Co. has been granted a franchise to build an electric road in Eau Claire at an estimated cost of $10,000. F. T. Framley and H. M. Bates are reported as interested.

Exeter, N. H.—A public hearing was held April 20 on the question of electric railroad extensions along some of the principal streets in Exeter. Many present spoke in favor of the project.

Gulfport, Miss.—J. B. Leger, of Gulfport, is stated as seeking contracts for about 2½ miles of electric railroad, and also for cars for the same.

Hagerstown, Md.—It is expected that cars will be running over the Funkstown extension in five or six weeks.

Hamilton, Ont.—The project of an electric road from Hamilton to Beamsville will be carried out. Mr. J. S. Campbell is one of the promoters.

Hartford, Conn.—The eastbound track of the New England Railroad, between Hartford and New Brighton, has been completed and the rolling stock is ready to be put in service. It is hoped that cars will be running by next week.

Hoboken, N. J.—Mayor Fagan has signed the ordinance granting the North Hudson County Railway Co. the right to operate electric cars in the streets of Hoboken.

Hudson, N. Y.—The Hudson Street Railway Co. has been incorporated with a capital stock of $50,000, divided into $100 shares. The company is to operate the road of the Hudson Electric Railway Co., which was sold under foreclosure March 6. The directors of the new road include W. H. Traver, S. R. Rainey, B. S. Johnson, R. W. Evans and Charles S. Rogers, of Hudson, and John E. Gillette, of Catskill Station.

Kittery, Me.—Work was begun on April 20 on the Portsmouth, Kittery & York Beach Electric Railroad, previously referred to in this column.

Lancaster, Pa.—Judge Dallas, of the United States Circuit Court, has been petitioned by William B. Given, Esq., Receiver of the Pennsylvania Traction Co., to give a decree by which he would be able to make the contemplated improvements, including the addition of 300-H. P. machinery.

Long Branch, N. J.—The Mayor and Board of Commissioners have accepted the amended franchise presented by the Atlantic Highlands, Red Bank & Long Branch Electric Railway Co. to operate a double track road between Oakwood and Second avenues.

Philadelphia, Pa.—William Steele & Son are about to build two passenger stations, each 103 × 12 ft., for the Fairmount Park Transportation Co., at Belmont and Elm avenues and Thirty-third and Dauphin streets.

It is stated that work will be begun next week on the electric road from Bound Brook to New Brunswick. Press reports state that Vice-President McAfee, of the New York & Philadelphia Traction Co., has signed the contract for building the road.

Pittsburgh, Pa.—The Pittsburgh & Mt. Washington Street Railway, previously referred to among our notes will be pushed as rapidly as possible. Ground has already been broken, and considerable material distributed along the proposed route.

The Beechwood Street Railroad Co., with a capital stock of $30,000, has been incorporated by Peter Shields, Frank McCann and others. The new line is to be built on Craig, Saline, Frank and other streets in the city.

Riverhead, N. Y.—A certificate of incorporation has been filed by the Riverhead, Quoque & Southampton Railroad Co. to build six miles of road from Riverhead to Quoque, and through Quoque to the ocean. Capital stock, $60,000, divided into shares of $50 each. The Directors include Joseph Martin, J. A. McElhenny, William J. Martin and others, of New York.

San Francisco, Cal.—Nothing has been done on the proposed line of railroad in Sonoma Valley except to make preliminary surveys and estimates of cost.

Savona, N. Y.—Plans and estimates for completing the Savona Valley & Lake Keuka Electric Railroad, mentioned among our notes last week under Corning, N. Y., are being prepared by the Chenango Engineering Co., Ackerman Building, Binghamton, N. Y. The roadbed has been completed except for two miles from the northern terminus, and the company will negotiate a loan for the completion of the construction. The total length from Savona to Lake Keuka will be about 20 miles.

South Middlesex, Mass.—The South Middlesex Street Railway Co. has asked for the location of tracks from the intersection of Waverly and Fountain streets over a number of the principal streets in order that it may connect with the proposed Framingham, Southboro & Marlboro electric road. A public hearing will be given May 5.

Summerville, S. C.—The street railroad line in Summerville, recently referred to, will be about five miles in length and laid with 40 T rails. It will be operated first by animal power and later by electricity. It is expected that the work will be completed by June 1.

Titusville, Pa.—The Titusville Electric Traction Co. has been granted a right of way through Oil Creek Township. The survey of the route between Hydetown and Pleasantville has been completed.

Wilmington, Del.—The General Assembly has been asked to grant a charter to the Delaware Central Railroad, which proposes to build an electric road from Seaford to Rehoboth, through Georgetown a distance of about 30 miles. The plan is to connect the latter place with a line of steamships to carry produce to New York. The distance between Seaford and Georgetown is about 50 miles by the present steam road, but is only 15 miles by the proposed electric road,

GENERAL RAILROAD NEWS.

Altoona & Beech Creek.—This is the name under which the bondholders have reorganized the Altoona, Clearfield & Northern, which was sold at Altoona on Feb. 26. It is now proposed to better the condition of the roadbed and rolling stock. The road extends from Altoona, Pa., northwest to Dougherty, 15 miles.

Baltimore & Ohio.—At a meeting of the Directors April 23, it was decided to pass the semi annual dividend on the Washington Branch, which extends from Relay Station, Md., to Washington, D. C., 31 miles. The semi-annual dividend of five per cent. was declared in November, 1896, and the failure to declare the May dividend is ascribed to heavy expenditures recently made for improvements to the roadbed and rolling stock. The capital stock of the Washington Branch is $1,650,000, of which $1,028,000 is held by the Baltimore & Ohio, and nearly all the remainder by the state of Maryland. Full dividends of 10 per cent. per year have been paid for years.

Cape Fear & Yadkin Valley.—On petition of representatives of the New York bondholders Judge Simonton in the United States Court, at Raleigh, N. C., has issued an order suspending the decree of foreclosure of this road, and reopening the case for a supplementary hearing on the question as to whether the road shall be sold as a whole (as ordered in the decree recently issued) or in sections represented by the three series of bonds. The hearing is set for June 9 at the Asheville (N. C.) Court.

Chesapeake, Ohio & Southwestern.—The litigation attendant upon the purchase of this road (under foreclosure) by the Illinois Central on July 25, 1896, has been closed by a decision recently given by the United States Court at Louisville, Ky. The amounts involved aggregated about $750,000. The general creditors claimed $475,000 of net earnings, together with $88,600 cash and $120,000 of accounts collected by the Receiver. The Court denied these claims and held that after payment of all proper charges, including claims, operating expenses, renewals and equipment notes, there were no net earnings. The claim of the Carnegie Steel Co. for $90,000 to secure the price of rails furnished, with interest, was also denied.

Chicago & West Michigan.—Charles Merriam, Treasurer, has notified the bondholders of this company and of the Chicago & North Michigan that in view of the continued depression in business the Directors of both companies have decided that the net earnings do not admit the payment in cash of more than one-half the amount of the coupons maturing May 1 and June 1, respectively. The holders of these coupons have been offered one-half in cash and the other half in scrip of the company, to be called "coupon scrip," payable in 10 years from April 27, 1897, with interest at five per cent., to be paid semi-annually. The company reserves the right to prepay the scrip at any time on 60 days' notice or to buy the same in open market, and agrees that no dividends shall be paid on the stock until the company shall have paid or offered to pay all the said "coupon scrip."

Chicago, Milwaukee & St. Paul.—The earnings for March and for the nine months ending March 31 have been reported as follows:

March:	1897.	1896.	Inc. or Dec.
Gross earn	$2,336,326	$2,749,334	D. $413,008
Oper. expen	1,325,954	1,634,556	D. 308,602
Net earn	$1,010,372	$1,114,798	D. $104,426
Nine months:			
Gross earn	$23,204,798	$25,452,379	D. $2,247,581
Oper. expen	13,919,426	14,907,571	D. 988,145
Net earn	$9,285,372	$10,544,808	D. $1,259,436

Kansas Central.—In pursuance of a decree of the Circuit Court of the United States in Kansas this road will be sold at auction at Leavenworth, Kan., on May 25. The upset price is placed at $200,000, and each bidder is required to deposit this sum as guarantee before his bid will be accepted. The road extends from Leavenworth to Miltonvale, Kan., 165 miles. The property was placed in the hands of receivers on Oct. 13, 1893.

Memphis & Charleston.—The United States Court of Appeals, at Memphis, Tenn., has granted an appeal from the decree given by Judge Lurton, of the Federal Court at Memphis, in the foreclosure suit brought by the Farmers' Loan & Trust Co., of New York, against this company. The decree ordered the road to be sold for the benefit of the bondholders. The Central Trust Co., of New York, trustee for $1,000,000 general mortgage, six per cent. bonds, opposed the suit, and immediately asked for the appeal, which has been allowed.

Middle & East Tennesse Central.—The sale of this road has been announced to take place on May 30, at Nashville, Tenn. The road will be sold in consequence of a decree entered in the Chancery Court in the case of Thomas H. King, trustee for the bonds, against the company, to foreclose a mortgage of $150,000. The road extends from Rogona, Tenn., southeast to Hartsville, 12 miles.

Oregon Railway & Navigation Co.—Judge Gilbert, of the United States Court at Portland, Ore., has issued a deficiency judgment and decree in the foreclosure suit of the Farmers' Loan & Trust Co., of New York, against this company, the amount of the judgment being $5,955,800. The decree states that from the sale of the property there has been paid upon the bonds and coupons of the company, as specified in the final decree rendered Aug. 10, 1895, the sum of $9,437,250, leaving $5,955,800 still due and unpaid.

Pittsburgh, Bessemer & Lake Erie.—A mortgage for $10,000,000 was filed at Erie, Pa., on April 23, by this company, in favor of the United States Trust Co., of New York. The mortgage is to secure a like amount of $1,000 5 per cent. 50-year bonds issued by the company.

Quincy, Omaha & Kansas City.—This road was sold under foreclosure at Chicago, on April 23, and purchased by a committee representing the bondholders, for $300,000. The road extends from West Quincy, Mo., west to Trenton, Mo., 134½ miles.

Shelton & Southwestern.—Suit has been brought in the United States Court at Tacoma, Wash., against this company by the trustees of the Dakota Farm Mortgage Co., who claim that the railroad company borrowed $20,000 from the Dakota Farm Mortgage Co., to build its road, on a promissory note due in five years, with interest at 10 per cent., and that this amount was not paid when due. The plaintiff asks for judgment in the sum of $25,325, and that the property and franchises for the road be sold under the decree of the Court. The road extends from Shelton, Wash., southwest 12 miles toward Gray's Harbor.

Southern.—The earnings for March and for the nine months ending March 31 were as follows:

March:	1897.	1896	Inc. or Dec.
Gross earn	$1,706,763	$1,543,951	I. $162,812
Oper. expen	1,157,112	1,088,821	I. 68,291
Net earn	$549,651	$455,130	I. $94,521
P. c. expen. to earn	67.7	70.5	
Nine months:			
Gross earn	$14,682,234	$15,115,767	D. 433,533
Oper. expen	9,844,685	10,213,983	I. 399,298
Net earn	$4,837,549	$4,871,784	D. $34,235
P. c. expen. to earn	67	67.7	

Terre Haute & Indianapolis.—On April 22 the state of Indiana brought suit against this company to recover about $2,000,000, claimed to be due under the terms of a special charter issued to the company in 1847. The charter provided that the railroad company should pay to the state school fund all its earnings in excess of 10 per cent. over the cost of operation and construction. It is alleged that the company has concealed its earnings through false reports, and that it has used the money for its own purposes.

Electric Railroad News.

Carthage, Mo.—A change in the management of the Southwest Missouri Electric Railway Co. was made at a meeting of the directors on April 20, by which the control of the road passes into the hands of the Carthage party who built the part of the road between Carthage and Carterville. The headquarters will be moved to Carthage. The road is 32 miles in length, running from Galena, Kan., through Joplin, Webb City and Carterville to Carthage.

Chicago.—The Calumet Electric Street Railway Co. is now in the hands of Receiver McKean, of the National Bank of Illinois. The Receiver is to furnish all the money necessary to keep the road in operation and to charge 6 per cent. interest thereon.

Los Angeles, Cal.—The Los Angeles Safe Deposit & Trust Co., as trustee, has filed a suit against the Pasadena & Mt. Wilson Railway Co. and others to foreclose the mortgage given on property of the latter company and asking for its sale to justify the mortgage indebtedness. This mortgage was contracted by the company as security for the $500,000 bonds issued by it for carrying out the construction of the Mt. Lowie road.

Louisville, Ky.—We learn that the Metropolitan Railway Co., of Louisville, which was recently incorporated, submitted to Mayor Todd an ordinance in which it offers $75,000 a year for the street car privileges of Louisville. The charter of the Louisville Railway Co., which operates all the street car lines, expires Sept. 28 of this year. The Metropolitan Company offers $75,000 a year for the period of 20 years. The company also binds itself to place conductors on every car, to heat them all in winter, to charge no higher fare than 4 cents a trip and to sell 8 tickets for 25 cents. The present company charges 5 cents fare, and does not have conductors.

McKeesport, Pa.—George Sheppard, on behalf of the bondholders, has filed a bill in equity against the McKeesport, Duquesne & Wilmerding Railway Co., asking that a Receiver be appointed.

St. Louis, Mo.—The Missouri Railway Co., which operates the Olive street cable line, the Laclade avenue electric road and a part of the Jefferson avenue line was transferred on April 17 to Edward Whitaker and C. D. McLure, President and Vice-President respectively of the Lindell Railway Co. The amount involved in the transaction is said to be nearly $2,000,000. It is said that the Lindell will absorb the Missouri by issuing Lindell stock in place of Missouri stock, increasing the capital of the Lindell company the necessary amount. Last week $124.50 was bid for Lindell shares. The Lindell is capitalized at $2,500,000 and the Missouri at $2,400,000.

Uniontown, Pa.—The sheriff has taken charge of the property of the Uniontown Electric Street Railway Co. on an execution for over $5 000. The total liabilities of the company have not been made public, but there is a bonded debt of $50,000, which has been defaulted on the interest and bonds for some time, and a great many minor claims and judgments.

TRAFFIC.

Traffic Notes.

The wholesale merchants of New York City have taken steps to form a permanent organization to promote periodical excursions by which retail merchants from a distance may come to New York at reduced rates.

New York City and New Jersey newspapers announce that the Erie Railroad is now carrying bicycles free not only on passenger trains, but on its ferryboats. The New Jersey bicycle bill has become a law, having been approved by the Governor last week.

The railroads of the Southern States have practically agreed upon the terms of a new association to take the place of the Southern States Freight Association. The new name is the Southeastern Freight Association. The objects of the Association, as stated in the preamble to the agreement, are as follows: 'For the purpose of interchanging authentic information in regard to the tariffs of the respective parties members of this Association; for consultation and mutual advice in regard to the reasonableness of tariffs, and the publicity of the same; and to aid in fulfilling the purposes of the laws of the States and of the United States affecting commerce; especially with the view of preventing illegal and unjust discriminations between persons and localities, or kinds of traffic." The passenger departments will also form a new organization, to be called the Southern Passenger Association.

Chicago Traffic Matters.

CHICAGO, April 28, 1897.

The new Western Passenger Association agreement has finally been adopted by the Western lines, and went into effect on Monday last. Twenty-three lines signed, and there are 21 yet to be brought in, but it is expected that they will have no strenuous objections to joining. A resolution was adopted, saying: "One of the purposes of this resolution is that immediate action may be taken in an organized manner to stop the payment of excessive commissions and to get the agreement into working order at the earliest possible date, hoping to secure the membership of all other lines not later than May 1." The meeting unanimously elected B. D. Caldwell Chairman. W. F. White, of the Santa Fe, is Chairman of the Executive Committee.

The Ohio River roads which are members of the Central Passenger Association have agreed upon a rate of $10.80 from Chicago to Nashville and return on account of the Tennessee Centennial. This is a rate of 1 cent per mile plus $2. Tickets are to be placed on sale on April 29 and will be sold Tuesdays and Thursdays of each week until Oct. 26. This low rate was secured by the Nashville people only after a hard struggle. The Common Council of that city passed an ordinance prohibiting ticket scalping within the city limits during the period of the exposition.

The Chicago Great Western has issued a tariff naming a proportionate rate on grain from Kansas City to Chicago, when destined to the seaboard for export of 5½ cents. The regular rate is 12 cents.

The large amount of grain now being carried by the lake liners has occasioned a large falling off in the all-rail shipments, the lake tonnage for the week ending April 22 having amounted to 101,239 tons. At the present time, however, no grain is being offered the vessel agents. Rates thus far have been not far from 1¼ cents a bushel on corn to Buffalo.

Eastbound all-rail shipments from Chicago and Chicago Junctions to points at and beyond the Western termini of the trunk lines for the week ending April 22 amounted to 65,782 tons, as compared to 79,854 tons the preceding week. This statement includes 21,697 tons of grain, 6,504 tons of flour and 10,005 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending April 22.		Week Ending April 15.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	4,628	7.0	4,706	5.9
C., C., C. & St. Louis	4,602	7.0	4,831	6 0
Erie	7,184	10 9	9,055	11.3
Grand Trunk	5,370	8.2	5,385	6.7
L. S. & M. S.	10,632	16.1	10,056	12.6
Michigan Central	10,040	15.3	17,620	22 1
N. Y., Chi. & St. L.	5,576	8 5	6,668	8.4
Pitts., Cin., Chi. & St. Louis	4,976	7 6	8,545	10 7
Pitts., Ft. Wayne & Chicago	8,560	13 0	7,811	9.8
Wabash	4,214	6.4	5,177	6.5
Totals	65,782	100.0	79,854	100.0